Vol. XIII. — No. 6. June 1931.

BULLETIN

OF THE

INTERNATIONAL RAILWAY CONGRESS

ASSOCIATION

(ENGLISH EDITION)

[385. (06.112]

ELEVENTH SESSION

MADRID : 5-15 MAY 1930

GENERAL PROCEEDINGS

4th Section : **GENERAL.**

INAUGURAL MEETING

6 May 1930, at 9 a. m.

PROVISIONAL CHAIRMAN : MR. JAVARY,
MEMBER OF THE PERMANENT COMMISSION OF THE ASSOCIATION.

The Chairman. — On behalf of the Permanent Commission of the Railway Congress, I suggest to you as President, **Mr. J. Moreno, Conde de Fontao,** Assistant Manager of the Spanish Norte Railway.

We shall be particularly happy if Mr. Moreno will honour us by presiding over our meetings; we have just had an opportunity of appreciating the splendid way in which we have been brought to Madrid by the Norte Railway, and by the excellent rolling stock and the permanent way. *(Applause.)*

The Permanent Commission also proposes as principal secretary: **Mr. Minsart,** Engineer of the Belgian National Railway Company. *(Applause.)*

— **Messrs. Moreno** and **Minsart** then took their places.

Mr. Javary. — Mr. President and Gentlemen, before giving up the chair to Mr. Moreno, I should like to wish that your deliberations should be very fruitful : I am persuaded that they will be.

You are, as it were, the brain of the Railways, the other Departments being the members. As you are the brain, in this brain you have the part of the deliberations which is by far the most important of all, as it is the one which deals with the conditions of the staff. I am certain that from your deliberations we shall see these questions in a new light, and that the opinions exchanged will lead us all to further progress, upon which I congratulate you in advance. *(Applause.)*

The President. — We have now to nominate the vice-presidents. I suggest for your consideration the following :

Mr. S. Pretorian, president of the Board or directors, Rumanian State Railways;

Sir Walter **Nugent**, chairman, Great Southern Railways, Ireland;

Dr. Ing. **B. Schwarze**, Geheimer Baurat, Reichsbahndirektor (German State Railway Company);

Mr. D. Markovitch, chief of the Commercial department, Yugoslav State Railways. *(Marks of approbation and applause.)*

— The Section, in accordance with the President's proposal, nominated the remaining members of the secretarial staff, and drew up a provisional agenda.

[656 .1 & 656. 2]

QUESTION XIII.

COMPETITION OF ROAD TRANSPORT.

Effect of road competition on goods and passenger traffic and the best methods of meeting such competition, both as regards the main lines and the branches.

Preliminary documents.

1st report (America, China and Japan), by Mr. C. B. Sudborough. (See *Bulletin*, June 1929, p. 767 or separate issue No. 7.).

2nd report (Belgium, France, Italy, Portugal Spain and their Colonies), by Messrs. Le Besnerais and Dégardin. (See *Bulletin*, November 1929, p. 2605 or separate issue No. 39.)

3rd report (British Empire), by Mr. H. L. Wilkinson. (See *Bulletin*, August 1929, p. 1287 or separate issue No. 15.)

4th report (other countries, except Germany), by Dr. A. Wasiutyński. See *Bulletin*, December 1929, p. 2877 or separate issue No. 43.)

5th report (Germany), by Dr. jur. H. Zietzschmann. (See *Bulletin*, January 1930, p. 191 or separate issue No. 54.)

Special Reporter : Dr. A. Wasiutyński. (See *Bulletin*, May 1930, p. 1466.)

DISCUSSION BY THE SECTION.

Meeting of the 7 Mai 1930 (morning)

(3rd, 4th and 5th sections meeting jointly).

Mr. CRISPO, President of the 5th Section in the Chair.

The meeting opens at 9.30 a. m.

Mr. Le Besnerais, *President of the 3rd Section* (in French). — I think I shall be interpreting the wishes of the members of the 3rd Section in welcoming the members of the offices and the delegates of the 4th and 5th Sections who have been called upon to discuss Question XIII with us to-day.

I shall ask **Mr. Crispo**, *President of the 5th Section*, to be good enough to take the chair at this meeting.

The President (in French). — I have to thank the President of the 3rd Section for the kindness he has shown us.

Gentlemen, we have to examine to-day, jointly with the members of the 3rd and 5th Sections, the very interesting question of motor road transport competition.

We shall first of all proceed with the reading of the special report and the final summaries, after which the speakers whose names have been put down will be invited to make remarks of a general character.

I shall ask those gentlemen to be as brief as possible in their statements so as to save time and make the discussion useful.

Mr. Wasiutyński, the *Special Reporter*, will now speak.

Mr. WASIUTYNSKI reads, with a few remarks, first the *résumé*, then the *final* summaries of his special report, which was published in the May, 1930 number of the *Bulletin*, page 1466 to 1492.

The President thanks Mr. Wasiutyński for his remarkable report and grants Mr. Zietzschmann permission to speak.

Mr. Zietzschmann, *Reporter* (in German). — In his report of 26th July 1929, the Special Reporter mentioned that the competition between the railways and the motor car also appeared in the programme of work of the International Railway Union. He mentioned that a sub-committee of the International Union was to study this question. He also called to mind that Germany and Switzerland were to be intrusted with drawing up a report. In the meantime, this has been done. In collaboration with the Swiss Federal Railways, Germany has drawn up a detailed list of questions, to which the various Railway Administrations have replied. Germany and the Swiss Federal Railways afterwards presented a report which was discussed very thoroughly at a joint meeting of the passenger traffic and goods traffic committees held at Nice on 31 March last. It may be of interest, in my opinion, to hear the resolutions which the interested railways agreed upon at the time. I am inclined to think that the wording which the 4th Section will adopt to-day for the summaries will perhaps approach more or less the resolutions passed on the 31 March at Nice. Lest I should engage the attention of the Assembly for too long a time, I shall confine myself to giving a brief summary of the essential purport of these resolutions.

The International Railway Union (I. R. U.) considers that a distribution of traffic between the railways and the road-motor vehicle and a cooperation of the two means of transport which would correspond to the interests of political economy is possible only if legislation is not favourable to one of these two means of transport. A reasonable arrangement between the two means of transport implies the possibility of the mutual competition under practically the same conditions.

On these grounds, the I. R. U. considers that it is mainly a matter of distributing the expenses equally between the railway and motor transport particularly as regards the following points :

1. Motor transport does not share, to the extent met by the railway, the expenses of building and maintaining the roads which it uses.

2. The motor, moreover, does not support the expenses it causes for the safety of the traffic, including the additional expenditure of material and per-

sonnel caused by the increasing motor traffic at level crossings.

3. The motor is not subjected to regulations governing the working hours like those imposed on the railways in the interests of the safety of the traffic.

4. The two forms of traffic have not yet been placed on an equal footing as regards responsibility for accidents and the responsibility stipulated by contract resulting from the transport of passengers and goods.

5. The traffic returns of the two forms of transport (passenger-kilometres and tonne-kilometres) are not subjected to comparable public taxes.

6. In general, from the jurisdictional and administrative points of view, the conditions of the railway traffic and of motor traffic are absolutely different, both as regards the concessions granted to the transport services and as regards the power of granting quickly to users special tariffs limited to individual cases.

It is necessary for all interested circles to make every effort to establish equality in the conditions of existence of the railway and the motor vehicle.

It was decided, moreover, that the International Railway Union should continue to study this question and in particular should keep itself acquainted with the important amendments made in legislative provisions, capable of affecting the relations between the railway and the motor vehicle. I wanted to make the Assembly acquainted with these resolutions by way of information because, I repeat, it would perhaps be advisable to establish some agreement between the summaries to be adopted to-day by the 4th Section and the Nice resolutions.

The President (in French). — Gentlemen, a delegate having asked for Mr. Zietzschmann's speech to be translated, I should like to say that there are ten speakers down on the list here. It is evident that if each speech is to be translated into three languages, we shall never finish. I think it will be best, therefore, if each speaker will confine himself to saying what is strictly necessary to clear up some point or to add some remark to what has been so well explained by the Special reporter on the question.

Of course, whenever a speaker proposes a text as a summary, preferably submitted in writing, we shall see that a translation is made of it. *(Marks of approval.)*

I shall ask Mr. Grimpret to speak.

Mr. Grimpret, Ministry of Public Works, France (in French). — I have listened with all the attention they deserve to the remarks made by the Special Reporter. They seem to breathe a faint odour of powder and I could not help recalling the words of a French humorist, Jules Renard, who said : « I don't know whether you are like me, but when I have a slight difficulty with anyone, I wish him dead. »

The railways are having not slight difficulties but considerable difficulties with the competition of the motor vehicle but we must not wish the death of the latter.

Putting myself in the position of the administrations of the Governments who arbitrate between the interests of both sides, these interests being moreover of quite unequal importance because those of the railways are quite pre-eminent, I shall recommend the amendment of the summaries in a more liberal sense.

In particular, I heard the Special Reporter speak just now of unfair competition. The words « unfair competition » have a meaning which is not merely moral but also juridical. I do not think we should be allowed to say that motor con-

tractors who convey transports within the four corners of the legislation of their country are guilty of unfair competition with the railways. Let the administrations be asked, I repeat, to arbitrate equitably and play the thankless part of arbitrator which consists in being called Guelphs by the Ghibellines and Ghibellines by the Guelphs ! But we must not ask for severe and iniquitous measures to be taken with regard to the competitors.

Mr. Landra, Italian State Railways (in French). — The last speaker considers that there are several expressions in the special report, such as « unfair competition », « gives it (motor transport), the advantage... », which ought to be struck out. It is perhaps merely a question of wording; there is a misunderstanding to clear up !

I think it follows clearly from our discussions and from our conclusions that we do not want to prevent the development of motoring, that is to say, motors.

It is true, on the contrary, that the users of the motor and the airplane look at us rather maliciously. I don't know how to express it but I mean somewhat like a racehorse would look at Sancho Panza's ass ! However, our discussions must not result in summaries which, when read fifty years hence, would cause our descendents to say : « Look ! our ancestors were still wearing wigs. »

I therefore approve of Mr. Grimpret's proposal to strike out all the words which are likely to be interpreted in such a way.

In the second place, I also support Dr. Zietzschmann who has just recalled resolutions 1 and 2 of the meeting held at Nice by the Commission of the I. R. U. I consider that there is something more exact in these resolutions and I propose that they should be taken into consideration as far as possible. It is true that these resolutions have not yet been approved by the Executive Committee, but it is to be hoped that they will not modify them.

To sum up, it is desirable that the large railway organisations should work together. In effect, one may say that the motions carried at Nice do not differ from the considerations, the final summaries, which have just been read here. The question is perhaps merely one of taking certain proposals into account.

Thirdly and lastly, there is a question of form, if I may say so.

The Special Reporter has made some statements. I think that certain of these statements may be transformed into summaries. We must have something stronger and more precise than statements.

Mr. Jourdain, Secondary Rys. of the Nord-Est, France (in French).— Mr. President, Gentlemen, yesterday, in the 5th Section, we discussed question XVII, one chapter of which relates to feeder railways in all countries. In recapitulating the situation of the feeder railways we were led to the conclusion that they were mainly suffering from motor competition. We sought the remedies to this competition and we agreed upon conclusions of principle. The lines on which we considered the question were as follows.

As regards the study of this question, I think that we remained of the opinion indicated by the last two speakers. In fact, for two years especially, and particularly in France, we have been trying to use motor transport services as auxiliaries to our railways. When we found that certain feeder lines could no longer be maintained in operation, but since we had the responsibility of ensuring the public service, we considered this solution, which so far has been favour-

ably received by the Ministry of Public Works of France, and which at the present time forms the subject of a special study on the part of that Ministry. In fact, certain companies have been called upon to show the depreciation of their most unprofitable lines and to assure a motor transport service, passenger and goods, instead of the rail service. We have begun to assure traffic in these conditions and I must say that the public is generally satisfied with it. For the transport of goods in particular, instead of merely receiving the goods at a transit station and carrying them to a small station on our system of feeder lines, we carry the goods direct to the consignee, and the public have appreciated this measure so much that they are asking for it to be made general on the lines on which it has been adopted.

I am pointing this out to you to let you know that we do not wish measures to be taken to-day that are likely to be too prejudicial to motor transport services which are becoming our auxiliaries and, I think, will be so more and more.

Nevertheless, we do really admit that there is at present a lack of equilibrium between the two forms of transport and we would ask, merely as a first conclusion from our examination — I do not want to keep the attention of the assembly any longer by developing further what we said yesterday on this matter at the 5th Section — we would ask, I repeat, the Governments to submit the motor services to a financial and technical control like that to which the railway services are subjected. Then, as second conclusion, we recommend that the motor services which are feeders or competitive to our services should, if possible, be taken in hand or placed under our control. Actually, we attach considerable importance to this second point. We are certainly suffering from motor competition in a more direct manner than the trunk railways, and it is the desire of a large number of us to attempt, in the counties and provinces, where we have railway systems of local interest, to combine the motor transport system with the railway system so as to obviate the competition of the motor services with the railways. We should thus try to organise in a more rational manner the two combined transports in these counties or provinces.

I ought to say that, in France generally, the secondary railway companies have got into touch with the trunk railways, and have asked to participate in the affiliated companies of these large railways, a matter which is dealt with in the report presented by Mr. Le Besnerais. Thanks to this participation, we are able to procure advantages for the public, which could not be procured by small local undertakings, to which the trunk railways could not in general grant connection facilities permitting direct goods and passenger traffic. These are all advantages by which the public profits through these new organisations and which the public largely appreciates.

Consequently, as regards the 5th Section, and as regards motor road transport, we confined ourselves yesterday to these two summaries to question XVII but we waited until to-day's meeting before settling them definitely.

Mr. Biraghi. Confederazione Nazionale fascista dei trasporti terrestri e della navigazione interna, Italy (in French). — In my capacity of representative of railways of local interest, I must say that my opinion is rather between that of the author of the special report and that just expressed by Mr. Jourdain who considers that government control should not me-

rely be a control set up by legislation, but should be applied with the same severity as for the railways.

On the other hand, I consider the final summaries to be equitable, and in particular what is stated in summary No. 4 is very interesting from the point of view of local railways. This summary deals with the radius of influence of the competition by motor services. It is stated very rightly that this radius varies from 50 to 100 km. (31 to 62 miles), but I think that this competition is more particularly evident around the large centres of national activity in each country, just in the very centres where the junctions between the local railways and the trunk railways are situated. This sphere of influence is thus very often divided into two parts, one part affecting the local railway and the other affecting the trunk railway, but we are in unfavourable conditions because heavy expenses are always imposed on the local railway at the junction with the trunk railway.

In Italy, for example, we are seriously menaced at the present time. We have almost 5 000 km. (3 100 miles) of local railways which have traffic in common with the State trunk railways. We have just revised, have had to revise the working agreements for these common stations, agreements which impose on us an expenditure of more than 3 000 lires per km. (4 830 lires per mile). All this expense which devolves upon us is favourable to competition. The special report considers not only our expenses but also the expenses of the State railways, and therefore I recommend that this point of view be considered, which is just a defensive point of view, namely that we railwaymen should promote by every financial and economic means the union between the local railways and the trunk railways with a view to meeting motor competition.

Sir Walter Nugent, Great Southern Railways. — The question under discussion is the most vital one before the Congress, as every Government is now considering the regulation of road transport and co-ordination with the railways, and will look to this Congress for guidance. I feel with the French delegate who has just spoken that there can be no question of putting motor vehicles out of existence.

I think the traffic will eventually come back to the railways. More people travel now than formerly.

My opinion is that some restrictions and a method of control are necessary. In Great Britain and Ireland none exist at present and there is nothing to prevent any private company competing with the railways — which they can do on advantageous terms, not being subjected to any of the restrictions and disabilities which are imposed on the railway company.

We are not afraid of competition, but I suggest it is necessary to lay down some general rules for governing same, on something like the following lines :

1. Traffic rules and regulations imposed on railways should be extended to road traffic.

2. The basis of taxation should be the same for both services.

3. Railways should not have to contribute to the upkeep of the roads to a greater extent than road vehicles.

4. Road traffic should be controlled and licensed.

5. Competition should be restricted.

6. Uncontrolled and unlicensed carriage of goods should not be permitted.

7. Private lorries should not be permitted to do the work of public carriers.

My belief is that no Government assistance whatever will be required beyond equality of treatment, and if this modernisation of transport can be obtained the railways will give far better travelling facilities than ever previously existed.

Mr. Ruud, Norwegian State Rys. (in French). — I should like first of all to mention some additional information as regards Norway on a question contained in report No. 4, namely, that the report of the Commission of Enquiry referred to and submitted in the spring of 1928 has not yet formed the subject of a decision by the Authorities. Perhaps they have not yet examined it fully, I do not know for certain. In my opinion, this proves that statistics would undoubtedly have been valuable in convincing the public authorities of the gravity of the problem, which is even more serious in countries like Norway where the railways are owned by the State.

The question of regulating the transport in the country, in so far as this is aimed at, becomes more and more difficult to solve. The longer we wait, the more will the private interests of the motor owners oppose those of the railways. In these conditions, I agree with the Special Reporter in emphasising the gravity of the problem and in underlining the disastrous consequences of the absence of regulations.

I should also like to draw attention to one special point, namely, the taxes imposed on motor vehicles, and their application. The question of the taxes imposed on motor vehicles, their importance and their calculation, and the question of knowing what expenses these taxes should cover form the subject of very lively discussions. The time at our disposal is too short to enable me to enter this wide subject, but I would crave your permission to mention a question which does not appear to have been examined. If interests chiefly those countries where the railways are operated by the State, but I have reason to believe that it also applies to countries where railway companies are in existence, where the concessions are always bound up with certain conditions and obligations and where these concessions have been granted with the very clear idea that the conditions and obligations would note be modified in any way during the period of the concession.

In countries where the State and the companies holding concessions have, during the course of years, made great sacrifices in order to meet the requirements of certain districts, certain regions or even of certain industrial undertakings, these organisations ought not to have the right to abandon the railways and to begin to effect their transports by road motor undertakings. If it is impossible to prohibit such a state of affairs, as it is a question of a form of transport other than that due to the initiative of the State or of the companies holding concessions, transports which they themselves have most often demanded, they ought to support the additional expenses involved so as to cover the cost of improvements, laying down, upkeep and even, in certain cases, the total reconstruction of the roads they are utilising. On the other hand, it would appear logical that the taxes imposed on motor vehicles should be heavy enough to enable them to provide a certain surplus intended to compensate for the losses suffered either by the State owing to the diversion of traffic for which railways have been constructed or

by the the companies who hold concessions and who are bound by their concessions to effect the transports in question.

I should consider it at least normal for such an organisation to be introduced for a certain transition period which would be sufficiently long to enable the railways to re-adapt their methods of operating, their equipment and their organic structure to the new requirements imposed upon them.

If my colleagues should share my opinion, I should like the point to be referred to in the summaries or resolutions proposed for final approval. I would remark that these requirements are quite the opposite of those of motoring circles who claim that all the taxes imposed on motor vehicles should be employed in improving the roads. There is no doubt that this possible demand by the authorities or the railway companies will meet with violent opposition, but that should not prevent us from formulating it. In any event, it is much more logical than that advanced by our adversaries and which I shall quote by way of curiosity, namely, that the railways should in fact pay indemnities to the public motor service to off-set the economy effected by the railways owing to the fact that the motor services assure a part of the traffic formerly effected by rail ! It is not the amount of the tax with which I am concerned, it is the principle.

Mr. Gilles-Cardin, Ministry of Public Works, France (in French). — Mr. Grimpret, General Director of Railways at the Ministry of Public Works of France, whose collaborator I am, pointed out to you a short time ago the ideas which the French Administration has already had. He also explained to you the difficulty of the task of arbitrator which it has to fulfil. In fact we, at the Ministry of Public Works, are called upon to exercise a very strict control over the railways and much less strict over motor services, and in these two camps, I will not say enemy camps but opposite camps, we are obliged, as we say in France, to have a foot on both sides of the barricade. We are called upon to play a rather difficult part, that of peacemaker, imitating a dove which brings an olive branch so as to restore peace in the two camps.

First of all, Gentlemen, I think I shall be voicing your opinions in offering to Dr. Wasiutyński, the Special Reporter, our thanks and congratulations for the very remarkable report which he has presented and I thank him above all for having recalled what is said in the opposite camp.

I had the honour, with Mr. Grimpret, of representing France at the World Motor Transport Conference held in Rome in September 1928, and Dr. Wasiutyński has recalled, very much to the point in my opinion, what was said at this Rome Congress, presided over both with authority and amiability by Senator Crespi, of whom the French delegates have very pleasant memories.

Following the report on the co-operation between road and rail transports, presented by Mr. Pourcel, Chief Engineer of the Paris-Lyons-Mediterranean Railway, and a communication presented by myself on the same question, the Rome Congress adopted a motion proposed by Mr. Pourcel and amended by Mr. Bour, Secretary of the French Automobile Syndicate and by myself, in the following form :

« That efforts should be made in every country to ensure the collaboration of road and rail to the best of the general interests, so that as far as possible, all

traffic should be forwarded in the most economical way;

« That in particular, the legal and fiscal regulation of the transports, which it is desirable should be made as liberal as possible, should not oppose this motion. »

In this motion, Mr. Pourcel, who is a railwayman, chiefly urged that the fiscal regulation of the French railways, which is very heavy, should be lightened. The Special Reporter has very rightly recalled that it is in France that the railways are subjected to the heaviest taxation : 32 1/2 % for passengers, 65 % on the extra charges for « de luxe » seats, and for the goods a tax of 10 % reduced to 5 % for certain goods of lesser value or of regular consumption.

I can assert, in agreement with Mr. Grimpret, that the French Administration of Public Works has not lost sight of this motion. This Administration has made every effort to conform to its directions and also to have them adopted by the French Administration of Finances. We have commenced a struggle, but we have not yet been able to improve the situation, and it seems to me that the Railway Congress could adopt a similar motion to bring about this desire for understanding and collaboration in the most liberal sense between the railway and motor.

Gentlemen, I understand that the President, Mr. Colson, former vice-president of the French Council of State, will submit to you a motion worded on these lines, but I do not wish to anticipate.

On the other hand, in his final summary No. 8, the Special Reporter discusses transport by containers. I should also like to recall what was said on this subject at the Rome Congress, where a motion was moved.

Here is the motion proposed by Prince Ghika, the Rumanian delegate, which was adopted after discussion and with an amendment by Mr. Grimpret :

The Congress appeals to Messrs. the Presidents of the International Chamber of Commerce, the Commission on Communications and Transit of the League of Nations, the International Railway Union, the International Association of Recognised Automobile Clubs, the International Tourists' Association and the Permanent International Bureau of Motor-Car Manufacturers to nominate an International Commission with the object of examining and eventually putting into execution the project of Senator Crespi — by starting a competition between the manufacturers of railway material and motor vehicles for the most practical solution of the combined service of transport of goods by rail and by road — with a view to eliminating as far as possible the costs of packing, storage and sorting, and effecting the transport of goods from the places of production to the places of consumption in the quickest and most economical manner, using motor services to extend the capacity of the railway wherever the railway cannot conveniently reach.

The Commission should also study the constitution of an international company of the type of the Compagnie des Wagons-Lits (International Sleeping Car Co.) to put into operation as soon as possible the combined transport of goods on a system selected as the most economical and effective and which should be standardised in all countries in the world.

The Congress records, with gratitude, the offer of the Royal Automobile Club of Italy to initiate the constitution of the necessary funds for the work of the International Commission by a payment of 5 000 dollars.

The question has, moreover, been taken into consideration by the International

Railway Union and I understand that it is making good progress.

Mr. de Souza, Ministry of Commerce and Communications, Portugal (in French). — Gentlemen, a short time ago, the expression « privilégiée » (« ... gives it the *advantage* over the railway »), which the Special Reporter inserted in his report in connection with the situation of motor transport, was qualified as inexact or perhaps excessive. I do not think that this was quite justified.

The railways are subjected to a very severe control, arising out of the monopoly-control which imposes upon them very severe responsibilities and rules for their operation. Motor vehicles, on the other hand, enjoy complete freedom. The latter are not subjected to control of rates and time-tables, nor the obligation of carrying goods of all kinds and passengers. There is also the absence of heavy taxes which are a burden on traffic by rail.

In Portugal, at the present moment, the question of remedying this situation is under consideration, not in the sense of prohibiting and controlling competition, but in the first place by setting up a system of taxation, the revenue from which will be used in developing the railways.

Yesterday, when we were discussing the question of feeders, I called the attention of the 5th Section to one point which seems to me to be rather important. There are secondary lines which satisfy real needs and which ought to be built from principles of good policy and according to the demands of national economy. Where roads are concerned, however, the expense and even the costs of upkeep are disregarded. Where railways are concerned, they are told that they must be self contained, they must support the costs of construction, and upkeep expenses themselves, but by reasoning in this way, no account is taken whatever of the national object and the greater interest which the construction of a secondary line represents for a country or district.

There is still one other consideration which should be brought to mind. In a country like Portugal, where most of the roads are rather narrow, the development of motor transport gives rise at the present time to frequent accidents. They even talk of widening the roads ! That is a great expense which the owners of motor vehicles are not asked to support.

We ought to have a fairly open mind so as not to impede the progress of motor traffic. But the railways ought to amend their old ways and try to adapt themselves with all the flexibility required by the demands of modern traffic and give every facility to the public. There is no need for excessive alarm because there are some needs which can never be satisfied without the railways. There is an extraordinary abundance of traffic especially in agricultural districts at certain times of the year, and in effect it is not the motor vehicle which conveys this but the railways. It is a question of form, either as regards the construction of new lines or for the retention of existing lines. We must therefore look twice before deciding to abandon the construction of lines or to abolish some of them. It is a question of an instrument of national economy which must be regarded with broad views, and even though there are expenses for the country, for the State, they should be taken into consideration, just like those of the roads. This is a consideration which, in my opinion, ought not to be lost sight of.

I should like to refer to a slight inexactitude in the report in connection with Portugal. It is stated that the length of

existing motor lines is 10 times the length of the railways. This is a mistake, because we have about 3 400 km. (2 100 miles) of lines in operation, but we haven't 34 000 km. of roads ! If this figure was really exact, it would mean that our railway system was far from sufficient. It is true that we lack many lines to satisfy all the needs of the country.

Mr. Giovene, Italian State Rys. (in French). — I should like to draw the attention of the Meeting to two points in particular.

Reference has already been made in the reports to the part taken by the International Railway Union (I.R.U) in the examination of the question « Competition and collaboration of the two means of transport : railway and motor vehicles. » One satisfactory solution of the problem is the operation of the motor services by the railways, either directly or through the medium of private undertakings. The I. R. U. has decided to compile statistics on this point and I think that we ought to wish every success to this initiative.

Secondly, there is the proposal of the World Motor Congress of Rome, which was mentioned just now by Mr. Gilles-Cardin. A competition for the design of the standard types of containers has been organised, and we know that, according to the latest news of the technical press this competition comprises two stages, the first of which will close next September. The importance of this initiative, which is intended to promote the collaboration recommended between the two means of transport, as well as with navigation, will be recognised. I think the Congress might express its approval of the competition which has been opened by modifying No. 8 of the final summaries.

To conclude, I should like to propose amending two of the final summaries as follows :

Number 8. — I propose to put : « The use of containers adapted to be loaded by rail is rapidly extending in the interior traffic and the results of the competition to select containers may facilitate considerably the collaboration between the various means of transport. »

Number 9. — It seems that a slight addition could be made to the last sentence which would read as folllows : « According to the information received, these two types of subsidiary undertakings give promise of excellent results in the matter of the collaboration of road and rail, and *it is to be hoped that it will be possible to compile regular statistics on this subject as well as on others* », the object of this last part of the sentence being a reminder of the special statistics which I emphasised just now.

Mr. Wasiutyński (in French). — In reply to the remarks made by some of the speakers in regard to the wording of my report, I ought to say first of all that the expression « Constatations finales » which I used instead of « conclusions » was imposed by the Congress.

The President. — That is true.

Mr. Wasiutyński (in French). — In my report I used the expression « concurrence nuisible » which was amended by the Secretariat to « concurrence déloyale » (« unfair competition »). Both have been considered to be too severe. By this expression I meant that this competition in no ways responds to the general interests of the public. This competition is favoured indirectly by legislation owing to lack

of regulations, and that is what should be stated.

It has also been pointed out to me that the expression « privilégiée » (« gives it the advantage over the railway ») is unsuitable. I consider that this remark is not right. Road transports *are* actually given an advantage over the railway. Perhaps when the motor regulations were drawn up, it was not understood what they in fact were. Perhaps railway legislation did not foresee the proportions which road competition would assume. At all events, the result has been a situation giving motor transport the advantage over the railway, and this must be opposed. However, there is nothing in my report which indicates that I recommend the application of severe measures for suppressing road competition. I merely demand an equal distribution of the expenses and obligations of the two forms of transport, in the public interest, which comes first.

The faults of the unequal situation of the rail and road cannot be corrected by the existing railway legislation. Railway rates are based on the value of the goods carried, but this principle is not and cannot be applied to the motor vehicle. The latter is free to convey traffic at any price which appears suitable, because it is a matter of no consequence whether goods of considerable value are carried at a high price and goods of little value are carried at a lower rate. Consequently, it is impossible to co-ordinate these two methods of fixing the rates. It must be concluded, therefore, that taxes would have to be placed on motor transport, while on the other hand, the taxes and obligations of the railways would have to be lightened.

As regards the summaries, I do not think it necessary that those of the Congress should be identical with the conclusions which have been passed or proposed by other organisations, nor do I think that there is any contradiction between the former and the latter.

In the summaries which I propose there are three : 11, 12 and 13 which in my opinion have the character of conclusions. Their form might be modified in that sense.

In number 13 I have quoted what is the most important, what appears to be the final summary :

The information received from the railway companies themselves and other documents prove that motor road transport competition which has increased very much on certain railways by reason of local circumstances, has been sufficiently diminished by other companies by the speeding up and improving of railway transport, by the organisation of regular motor services as a subsidiary undertaking and by mixed services of direct transport as well as by other technical and rates measures of the railway companies supported by governmental legislative measures.

After indicating the three principal measures : technical measures, rates measures and governmental measures, I add :

Projects of legal reform with the object of regulating the obligations and expenses of the motor services and the lessening of certain fundamental railway obligations have been promised by several Governments.

These reforms are thus quite possible. Lastly, I express the opinion « that motor road transport duly coordinated will become a powerful ally of the railway and assist in completing and developing communications to the greater profit of the public.

My final idea is therefore coordination and not competition between the two forms of transport.

After all, transport by motor is an improved form of ordinary road transport and has changed somewhat complete door to door transport. The latter has become cheaper and more convenient. The ratio between the price of cartage and the price of main transport by rail has merely been modified. We ought therefore to regard as our aim the coordination of these two forms of transport.

The President (in French). — I think we may consider the general discussion as closed.

We have now to endeavour to arrive at general summaries of a nature to inform the Administrations of the measures which experience has shown to be effective in meeting road transport competition.

I shall move that the final summaries as presented by the Special Reporter be approved, leaving it to the Assembly to suggest eventually any additions or amendments.

With a view to speeding up the discussion, it would be advisable to submit any draft addition or amendment in writing to the Bureau who will inform the Meeting.

Mr. Wasiutyński. — In accordance with the desire expressed by Mr. Gilles-Cardin, I propose to replace the expression « unfair » by « prejudicial to the public interest ».

The President (in French). — It is proposed the word « unfair » be replaced by the milder expression « prejudicial to the public interest ».

Mr. Landra (in French). — There still remains the expression « privilégiée » (which gives it [motor transport] the advantage over the railway »). Do you want it to remain ?

Mr. Wasiutyński. — This expression seems to me to be very exact !

The President. — I shall now ask Mr. Colson to speak.

Mr. Colson, Ministry of Public Works, France (in French). — Mr. President, Gentlemen, without wishing to alter anything in the summaries which have been made by the Special Reporter, and which correspond to well known facts, I should like to draw up motions which I shall submit in writing as requested just now by the President.

However, I should like to begin by explaining them by saying a few words on the question. I have had to study this question a great deal and have written several works on it.

I think it may be regarded as a sure thing that the railways will maintain their superiority for long distance runs. But for short runs, the expenses involved by transhipment at each end in order to go from door to door are such that we cannot hope to keep any of this traffic, except, in special circumstances, up to 30 or 40 km. (20 or 25 miles) at the least. For distances of at least 100 or 150 km. (60 or 90 miles), on the contrary, the railway can carry at lower total rates than road motor transport. For intermediate distances, the railway might retain a considerable part of the traffic if it was not subjected to heavy inconveniences on the one hand, and, on the other, taxed with expenses that the competitive means of transport has not to bear. These inconveniences result from the extremely strict conditions which are imposed on the

railways by the legislation of most countries.

I think that this very strict legislation was justified by the monopoly of the railway, but I must admit that to-day, in the face of transport which may be effected in conditions of time and at rates which, while not being quite so economical, are of the same order of magnitude, it is essential that the railway should be given a little more liberty than it has at the present time if it is not to lose all its traffic and if the millions of capital involved in building the railways are not to be deprived of all remuneration through being only slightly utilised.

Secondly, owing precisely to their enormous superiority, the railways so far have been in most countries one of the milch cows of the budget. They have been burdened with taxes which, being added to the price of transport and not appearing in the accounts of the undertakings, prevent the latter from raising their rates when their expenses increase, for the simple reason that their clients are already very heavily charged. In France, these taxes are exceptionally heavy and this is the case in many other countries. The German railways, for instance, are suffering cruelly from the very heavy burden of taxes imposed upon them, although these taxes are less than half for passengers and about 2/3 for goods of those we have in France.

That is why I should like to ask the Congress to pass a resolution tending to establish fiscal equality between the different forms of transport, and with your permission I should like to read it before handing the text to the President :

« The Railway Congress considers that railways still constitute the most economical means of conveying bulk traffics over any distance, and for the transportation of goods in general over long and medium distances, and that it is to the public interest that such traffics should be retained by the railways. The railways have to contend with the following difficulties :

« *a*) Taxation, in many countries in excess of that imposed on any other form of transport;

« *b*) Legal and other obligations, which are often more injurious to the railways than beneficial to the public.

« In order to avoid serious consequences, economic and financial, it is necessary to remove these two causes of inequality.

« In regard to (*a*), the Congress recommends that the various modes of transport be placed on an equal footing as regards taxation, the cost of road maintenance, and the amortisation of invested capital.

« It is suggested that the contribution of motor transport towards road costs be collected in the form of annual taxes, either on the vehicles themselves, their fuel, or their tyres, as is already done in certain countries.

« In regard to the second point *b*), the Congress considers that in view of the loss of the monopoly of long distance transport which the railways enjoyed before the development of motor transport, the present restrictions relative to the fixing of rates, and their date of operation should be so modified as to place the railways on an equal footing with their competitors.

« The Congress considers that if this concession be made, the railways should organise lorry transport in order to give door to door services, similar to those of their competitors. »

I am prepared to provide explanations to any of our colleagues who care to ask,

but I wish to draw your attention at once to one point in particular. In order to secure equality of treatment, which is what we are demanding, the taxes which are a charge on the costs of transport should, in many cases, be levied on the competitive vehicles, under one form or another. It is obvious that we cannot demand that tolls should be levied on the roads, because this would be an intolerable inconvenience for the public. We can, however, demand that the upkeep of the roads should be charged to the motor vehicles, because even though they are not the only users of the roads, they certainly occasion four fifths of the costs of upkeep of the roads, which is manifest in the enormous increase in these costs in every country. In so far as these expenses are due to motor transport, they ought to be paid by the clients of this transport, unless the countries prefer to take into their charge not only the upkeep but also the interest and depreciation of the capital of the railways.

As regards the roads it may be assumed that the interest on the capital, which is very much less, corresponds to the services which they render to traffic other than that of motor vehicles and should be covered by the tax. As regards the railways, there is not a single country in the world which is capable of assuming this expense to-day, and in that case every effort should be made to establish some equality of regulation.

From another standpoint, the very great advantage which we must recognise in motor vehicles is that they convey from door to door, and at times and days arranged with the client. The client will ask for goods to be taken from him by motor and to be conveyed to a certain place. The contractor replies : « I shall call for them on such a day at such a time and shall deliver them on such a day, at about such a time at the place mentioned. » The customer finds that the motor contractor effects in 24 to 48 hours the conveyance for which the regulation time by rail is 4, 5 or 6 days. However, like all services offered to the public, motor services cannot undertake engagements except for the date on which they will have the means of carrying them out after fulfilling their previous engagements. Their great advantage is in being able to know this date, in being able to tell a customer on what date he can reckon. That, it must be admitted, is a considerable advantage, in contrast to the ordinary rules of the railways. The railway is obliged to accept every traffic offered, and to effect it in times which, being regulation times, must of necessity be very long. These times cannot be shortened, because the railways cannot be obliged to have the plant and appliances necessary for effecting in a short time all the traffic which arises at times of abundance, the obligatory character of the service, and the principle of equality of treatment preventing a general short time to be fixed. These conditions, however, do not put any obstacle in the way of informing a client when his consignment will arrive at its destination, depending upon the degree of congestion.

The railway must be given rather more facilities in this respect. It must also be given more facilities in combining its rates. In France, we have already tempered the very rigorous jurisprudence which hindered the setting up of fixed terms between two given points. A little flexibility must be given to all the services of the railways and I think that, when this flexibility has been given, it will be the concern of the railways to

give to the public the satisfaction which the public motor services are giving.

The railway cannot pretend to render services like those rendered by a road vehicle to a private person or a merchant owning it. Motor competition will develop more and more in the shape of vehicles belonging to those who are using them. All the great industries, as also all private persons who travel much, will have their cars or lorries to answer their normal requirements. If the services belonging to the great industries are not to cost less than the railway rates, they must, like the users of the railways, pay the expenses which they cause to the community. To charge them for the upkeep of the roads by way of taxation is merely to establish equality of treatment.

From the point of view of the general conditions of the forms of transport, the railways can be given the facility of meeting competition by means of a greater flexibility in the legislation concerning their responsibilities and the time required for conveying traffic. I am convinced that a service effected in the existing maximum times for conveying traffic, with the right to state the date of collection and delivery of each consigment, would enable the railways to keep a large part of their clients when they have organised good lorry services for collection and delivery. They will have to organise themselves so as to collect the goods at the door of the client and deliver them to the consignee on the date stated. If, on the other hand, the competitors support at least the upkeep and policing of the roads they use, equality in the conditions of competition will be re-established and the financial welfare of the railways will be assured.

Mr. Landra (in French). — I have listened with much interest to the speech made by Mr. Colson. Mr. Colson is a very distinguished authority. For a long time we have been acquainted with his works which we have studied for a good number of years, for thirty years. The motion he has put forward represents a summary which could well be put to the vote, but it would be preferable if the motion was communicated to us in a form such that we could study it carefully. If the Meeting has no objections, it could be reproduced in the *Daily Journal of the Session* so as to bring it to the knowledge of everybody, and to-morrow morning everyone would be able to express his views.

Mr. de Souza (in French). — I have listened with keen interest to the excellent address by Mr. Colson, whom I recognise to be an authority. I always keep his work « Tarifs et Transports » and his « Cours d'Economie Politique » handy for reference. They constitute a breviary of economic questions applied to the railways.

I warmly support his motion, but with a reservation which I hope Mr. Colson will allow me to state.

He asserts that it is impossible to pretend to impose tolls on motor transport, but he states that it is easy to have the expenses supported either in the form of annual taxes on vehicles or taxes on fuel. In Portugal, the taxes on vehicles have just been suppressed, because they gave rise to considerable inequalities. There are the public vehicles which did not pay any more than the private cars used only for a few days. It has been thought preferable to replace this tax by an increase in the tax on fuel, which is more just because it is proportional to the distance travelled.

On the other hand — and this is being considered and, I believe has even been

adopted — it has been decided to make motor vehicles pay a transit tax, and the practical method of applying this has been considered.

Consequently, I should like to see the absolute character of the assertion that it is impossible to pretend to impose tolls on motor transport, mitigated a little. Despite the apparent difficulties, it does not at all appear to me to be an impossibility.

Mr. Colson (in French). — I have indicated the two forms of taxation; annual taxes on vehicles and taxes on fuel. Each country may employ more or less the one or the other. As to the collection of tolls on motor vehicles, I confess that I cannot see any means of doing this. In order to collect tolls on motors, it would be necessary to have, on all roads, stations at every three miles, for example, in order to ascertain the passage and loading of the vehicles. This appears to me to be impracticable and intolerable.

I am quite willing to replace the idea of *impossibility* by that of *extreme difficulty*, but I do not think that a toll can be levied in practice. That is why it is useless to ask for it to be imposed.

Mr. Ottone, National Railway and Tramway Company, Italy (in French). — I think that we are all agreed as to the principles of the motion proposed by Mr. Colson, but I should like to ask for a part of it to be amended. He said that railways still constitute the preferable means of transport over long and medium distances, but he has not defined the short distance which he excludes. Does this mean that, for short distances, the railways no longer justify their existence ? It is evidently impossible for the Congress to come to such a conclusion. Nothing that I have read in the excellent report of Mr. Wasiutyński would justify it.

I think that we might say : « The railways in general still constitute the most suitable means of transport. »

We shall see afterwards whether there are railways which still justify their existence and whether there are some which have ceased to be of use to the general economy.

The President (in French). — Mr. Wasiutyński will now speak.

Mr. Wasiutyński (in French). — Mr. President, Gentlemen, Mr. Colson is an eminent authority on economic questions, and particularly on the subject of transport competition. He has written some remarkable works on this subject. The conclusions which he proposes contain some very interesting points which we all appreciate, but in my opinion, they are all contained in the reports of my colleagues and in my summaries. I think that before accepting the conclusions proposed by Mr. Colson, which we only know by word of mouth, it would be best to submit them to a small committee who could present them to us to-morrow with the amendments which they consider necessary to make. I will confine myself to noting some points raised by the last speaker, and among others, first of all that which asserts that the railways are suitable for conveying traffics over long and medium distances. According to my view, railways are suitable for conveying traffics in bulk, in large bulk over any distance.

Secondly, Mr. Colson, as I have understood, proposes to increase the taxes imposed on motors so as to be able in this way to put the railways and motor transport on an equal footing. In my opinion,

this is not the only measure which may be taken. One of the difficulties, the solution of which does not appears clearly in the conclusions put forward by Mr. Colson, is that the present system of rates does not allow the railways and motor transport to be placed on the same footing The great favour enjoyed by motor transport with the public is that this transport is effected from door to door and at a comparatively low cost, for the indirect reason that some of the cost of these traffics is borne not by the carrier alone, but by the bulk of the tax-payers, and that the price charged does not depend upon the value of the goods. According to what I have understood, Mr. Colson proposes to give a greater liberty to the railways. Is it the liberty which would consist in choosing their rates ? But that would be a revolution in the economic situation of every country. In every country, the economic conditions of agriculture, mining, industry, etc., are based to a large extent on the cost of transport. If we alter the latter, everything will fall to the ground. It is necessary that the solution proposed by Mr. Colson should be understood.

I again recommend the publication of the conclusions proposed by Mr. Colson so that everyone may have the opportunity of studying them as they deserve.

The President (in French). — It would be desirable to postpone until to-morrow, if possible, the discussion and drawing up of the summaries. Unfortunately, this is impossible, in view of the work we still have to do. I therefore propose to suspend the meeting and shall ask those delegates who have any addition or amendment to propose to the summaries of the Special Reporter, to be good enough to submit them in writing to the Bureau.

— The Meeting was suspended at 1.0 p.m.

RESUMPTION OF THE DISCUSSION.

The President (in French). — We shall now proceed to read the summaries one by one, enumerating the suggestions for amendment, addition or modification, which have been submitted to the Bureau. If the Meeting approves, we shall proceed in numerical order and then we shall pass on to the discussion and approval according to the case. *(Assent.)*

§ 1 is worded as follows :

1. Because of the growing importance of motor road transport and its competition with railway transport, the common interest of both methods of transport, as also public interest, require an exact appreciation of their respective values as regards communication as a whole and the coordination of their services.

To attain such an end, the present legislation relating to motor transport, which in most countries gives it the advantage over the railway, must be modified in such a way that motor transport may bear its full share of road expenses, and the public expenses of both methods of transport should be equally divided.

— After a brief controversy, it was decided to give the title « conclusions » (1) to the wording of the final summaries presented by the Special Reporter.

The President (in French). — In the text of § 1 which I have read, it has been proposed to strike out the passage :

« which in most countries gives it the advantage over the railway. »

(1) In the French text alone.

In addition, Mr. Lamalle has suggested that a third point be added to summary No. 1, as follows :

« It is desirable that part of the taxes with which motor transport is to be charged, be handed over to the railways as a compensation for the losses they sustain through transportation at reduced fares (especially of workmen), with which motor transport is not burdened. »

Mr. Jourdain (in French). — I wonder if it is good policy to ask for an additional tax on public motor transport.

The President. — I shall ask Mr. Lamalle to explain the reasons for his proposal.

Mr. Lamalle, Belgian National Ry. Co. (in French). — One thing is evident : it is that the railways support expenses with which motor transport is not burdened. The railways are obliged to convey workmen at ridiculous fares, while motors convey all passengers at full fares. In some countries, it is recommended that some of this expense should be borne by motor transport in the form of special taxes, and the revenue from these taxes would be paid into a special fund, a portion of which would be used for the relief of the railways.

The President (in French). — You insist on the insertion of this third paragraph.

Mr. Lamalle (in French). — If the Meeting has no objection, I should be glad to see this proposal mentioned, but if nobody supports it, I shall abandon my proposal on condition, however, that it is mentioned in the minutes.

The President (in French). — We shall put to the vote the proposal submitted by Mr. Lamalle.

— The majority of the Meeting were against this proposal.

The President (in French). — The proposal made by Mr. Lamalle is therefore rejected, but, in accordance with his wish it will be mentioned in the minutes.

— Summary No. 1 was adopted as it was worded by the Special Reporter.

We pass on to No. 2.

The system of free competition allowed in some countries, or the purely formal authorisation of regular motor services without regard to existing communications and without sufficient guarantee of the civil responsibility of the concession holders, is not at all in the interest of the public.

The concession of regular motor services competing against the railway or other communications already in existence which do not give the public any new advantages should be prohibited. Before granting a concession to any regular motor service, the authorities who have the right to do so should be obliged to consult the railway companies of the district about it.

The Bureau has received a proposal tending to modify the last sentence of the last paragraph beginning as follows :

« Before granting a concession to any regular motor service... ».

It is proposed to say :

« Before granting a concession to any regular motor service, the authorities, respecting the rights of the railway administrations of the region, which rights are stated in the concession contracts, ought to be obliged to consult the said railway administrations on this subject, giving them the preference. »

It is almost the same thing as the text of the Special Reporter. The modification merely consists in alluding to the rights of the railways, which rights arise from the concession and in adding that the preference ought to be given to them.

Mr. Wasiutyński (in French). — This narrows my wording since only those railways are aimed at as have these rights in their concession contract, but not all railways. However, all the railways in their zone ought to be consulted, even if the clause is not provided in the concession. That is not the same thing and for that reason I consider this modification as superfluous.

The President (in French). — It is, indeed, narrower. I should like to know whether the Meeting agrees to accept this modification or to retain the original wording.

Mr. Miclesco, Rumanian State Railways (in French). — While expressing my agreement with the Special Reporter, I suggest the following modification :

Could we not add that, in the case of parallel lines, it is forbidden to put motor services in competition.

A delegate (in French). — There is a slight confusion of expressions. After all, in the second paragraph, only the concession of regular motor services is referred to, but at the beginning of the summary it is stated that concessions are not always granted, but « authorization ». Are services holding concessions alone intended ? There are two distinct systems. In France, simple authority differs from a concession as regards conditions.

The President (in French). — In Italy, authority is only granted provisionnally and is renewable every three months. A concession is granted for a period of nine years. Authority gives no rights whereas a concession holder is subsidised.

Mr. Wasiutyński (in French). — I am quite agreed to the insertion of the word « authority » after « concession » in the passage under consideration and to say : « Before granting a concession or authority to any regular motor service, etc. »

As regards the parallel lines, I admit that the motor may enter into competition if it affords to the public advantages which the railway cannot give. But if the motor gives no more than the railway, authority ought to be refused. I may mention once more that, in Germany, the granting of authority is subjected to very interesting conditions, which I have referred to in my report, namely, if the motor transport gives nothing more than the railway, or *presents advantages that the railway is in a position to organise by modifying its services*, authority is not given. To the railway must be reserved everything which is appropriate to it and nothing more. Given equal opportunities, the railway ought not to be competed with by the motor. By speaking in this way, we cannot be accused of partiality.

We do not wish to oppose the granting of concessions to regular motor services if these services can offer more advantages to the public, but if the motor services provide nothing more than the railways, we are in a good position to protest. That is what I say in other words in my report. There can be no question, therefore, of adding restrictions concerning parallel lines.

A delegate (in French). — I propose

to amend the last sentence of the second paragraph as follows :

« Before granting any concession for a regular motor service, the authorities concerned ought to take into consideration the interests of the railways in the district, which should be consulted from this point of view and be enabled to voice their opinion. »

The President (in French). — If they are obliged to consult the railways the latter will obviously lay great stress on the interests they have in the matter.

The same delegate. — That is my opinion.

The President (in French). — « Consultation » does not mean make sacrifices for others. The consultation would be in the interests of everybody.

Mr. Gilles-Cardin. — Suppose we said « ... taking their interests into the greatest consideration ».

The President. — I think we shall agree to the following wording for the last part of the second paragraph of Summary No. 2 :

« Before granting authority or a concession for any regular motor service, the authorities concerned should be obliged to take into account the railways of the district and consult the owners thereof. »

Are there any remarks ?

— No one desired to speak.

Paragraph 2 thus amended is therefore adopted, and we shall now proceed to No. 3.

3. The indisputable advantages of motor transport, such as direct door to door services, operation by small units running frequently and rapidly, immediate organisation of a service with but little capital expenditure, are a valuable adjunct to the railway in many cases — services between stations, small and new traffic, tourist services, etc., — and everything points to the advantage of collaboration between it and the railway which is the best transport method for a great number of passengers and heavy goods.

To assure as far as possible a close collaboration between motor transport and the railways for transport as a whole, the railways should have the preference for obtaining the concession of regular motor services and profit by it.

Are there any remarks to make on this text ?

— No objection is raised and No. 3 is adopted.

Summary No. 4 :

4. Motor transport competition is especially found in short distance traffic [up to 50 and 100 km. (31 and 62 miles)] and lessens railway traffic to an extent that depends upon the importance of the motor service, legislation concerning it and other local circumstances; in the case of passenger traffic the losses are as much as 24 % of the receipts of the main lines and as much as 60 % for lines of local interest, and in the case of goods traffic as much as 10 %.

These figures include the losses due to the competition of irregular enterprises as well as cars and lorries owned by private individuals, which, in certain countries where motor traffic is highly developed, are much more important (four times as much in Germany) than the losses due to the competition of regular motor services.

Has anyone any remarks to make ?

— Nobody wished to speak.

No. 4 is therefore adopted in its present form and we shall proceed to No. 5 :

5. The passenger fares of regular motor services are usually like those of 2nd class railway tickets, but in certain countries as much as 60 % higher, in others lower.

Goods rates also are regulated by the railway rates and for short distances are usually lower, but in some countries they are several times as high.

Such differences in rates testify that motor transport competition, especially in the case of passenger traffic, must be attributed to other advantages than its economic results.

Are there any remarks ?

Mr. Mayer, Nord-belge Lines (in French). — The last paragraph says :

« Such differences in rates testify that motor transport competition, especially in the case of passenger traffic, must be attributed to other advantages than its economic results. » I should prefer to word this paragraph as follows : « Such difference in rates *proves* that motor transport competition, especially in the case of passenger traffic, must be attributed, apart from economy, in certain cases to other advantages appreciated by the users and which ought to engage the attention of the railways. »

The President (in French). — It is a matter of form. We might say : « The diversity of these charges proves that the road transport competition, particularly for passenger traffic, must in some cases be attributed to causes other than economy. »

Are we agreed upon this text ?

This text is approved and Summary No. 5 is adopted with this amendment.

We now pass on to No. 6.

6. To diminish motor competition the following improvements in rail transport have been carried out with good results:

a) Passenger traffic :

Organisation of local services of light and frequent trains formed of rail motor coaches and rail motor omnibuses on lines where traffic is small, with provision for frequent stops between stations; organisation of through services on branch lines; organisation of cheap excursion trains on holidays; improvement of train connections at junctions and various timetable improvements; 3rd class sleeping cars and upholstered seats; luggage in advance, etc.;

b) goods traffic :

Speeding up of transport by means of direct services and complete loads, attached in certain cases to passenger trains; reduction of time spent on the journey and halts at stations; reforms in consigning of goods, especially in the case of parcels so as to facilitate their collection and delivery and the speeding up of their transport; more prompt forwarding of goods from transhipment stations; organisation of private depots for clients, etc.

— As no alteration was proposed, this summary was considered as approved.

Summary No. 7 :

7. Road arrangements to assure a complete door to door service for clients have been completed on certain railways under the form of motor and motor lorry services organised by the railway company itself or by means of agreements with private enterprises.

Are there any remarks ?

Mr. Pellarin, French Est Ry. (in French). — It seems to me that it would be preferable to put this paragraph in sub-paragraph *c*) in No. 6 instead of in No. 7 !

Mr. Wasiutyński (in French). — It is not a question of an improvement but of setting up a new organisation.

The President (in French). — I think it is the same whether this paragraph is put as 6*c*) or is retained as No. 7. I should like to know the views of the Meeting on this matter. (The majority asked for it to be retained in No. 7.) We shall leave it in No. 7 then and proceed to No. 8.

8. The use of containers which can be loaded onto both wagons and motor lorries is increasing rapidly on some railways and facilitates direct transport for small traffic.

A slight amendment to this summary has been proposed. It is that the English word « containers » should be inserted in the French text at the beginning of the paragraph which would read : « L'emploi de cadres de groupage (containers) pouvant être chargés, soit sur des wagons, etc. »

A request has also been made to add the following passage :

« The results of the international trials to select standard types may facilitate collaboration between rail and road. »

Mr. Belmonte, who is the author of this proposal, will perhaps give us some additional information.

Mr. Belmonte, Italian State Rys. (in French). — The World Motor Transport Congress, which was held in Rome in 1928, brought out the importance of these containers for rapid traffic. We all know what these containers are. They are cases which are transportable, even by sea. The Automobile Club of Italy, supported by another international organisation, has taken the initiative of organising an international competition for the design of these containers. The first stage of this competition will take place next September. In France, many railways have already adopted the container.

The results of this competition with a view to fixing upon standard types may facilitate the relations between the two means of transport, rail and motor, and we ought to recognise the importance of this.

Mr. Gilles-Cardin. — I second the motion put forward by Mr. Belmonte.

Mr. Wasiutyński. — There is no mention of it in the reports.

Mr. Belmonte. — It is a very important question, however.

The President (in French). — We might put « might » instead of « may ». However, officially, we know nothing of this initiative and the Special Reporter does not mention it.

Mr. Belmonte. — But we, who are railwaymen, we know of this initiative.

Mr. Wasiutyński (in French). — Before formulating this summary, it would be necessary to *state* that the results of trials organised according to information received, might facilitate, etc.

Mr. Mayer. — We might say : « The results of the international trials set up to select standard types may facilitate collaboration between rail and road. »

Mr. Gilles-Cardin (in French). — We ought to put « pourraient » (« might »).

The President (in French). — We should say then : « The results of inter-

national trials to select standard types might facilitate collaboration between rail and road. »

Are we agreed ?

Mr. Pellarin (in French). — I would point out that another point of view of the problem is thus disclosed. The question of loading the containers either on trucks or on motors is not of great importance for short distances, but on the other hand it is of great importance for long distances.

The President. — We can therefore consider as approved the text of No. 8, amended and amplified as indicated.

We now come to No. 9.

9. A great many railway companies have organised or are organising regular motor services as subsidiary undertakings which are to act as feeder services or to run parallel with their own lines to relieve local congestion. Some of these railway companies (Pennsylvania Railroad — Great French Companies — Dutch Railway Companies — Swiss Federal Railways) have confided the running of their regular motor services as well as the cartage services and all business resulting therefrom to companies organised as independent undertakings on capital provided by the railway. According to the information received these two types of subsidiary undertaking give promise of excellent results in the matter of the collaboration of road and rail.

An Italian delegate has proposed to add, to the Railway Administrations enumerated, the Italian State Railways.

A proposal has also been made by Mr. Giovene to the effect that the following should be added at the end of the paragraph : « et il est à souhaiter qu'une statistique régulière puisse être établie à ce sujet ainsi qu'à d'autres (« and it is to be hoped that regular statistics will be established on this and other matters »).

Mr. Wasiutyński (in French). — I must remark that there should be statistics permitting a better opinion to be formed on all the summaries. There is a lack of statistics from every point of view. In adding the passage proposed, it will appear as if we are not asking for statistics on the other points, which is not the case.

The President (in French). — As regards the other points, statistics have not the same importance for us.

A delegate (in French). — This motion might be worded in a different way.

The President (in French). — Suppose we said : « Il est à souhaiter qu'une statistique régulière puisse être établie à ce sujet ainsi que pour les autres questions » (1).

— Adopted.

We shall pass to No. 10.

10. Mixed services of direct transport by railway and regular motor services belonging to the railway as well as other enterprises with possible choice of route have been organised by several railway companies in the United States as well as in certain cases in Europe. Such services seem likely to develop.

— There being no remarks, No. 10 was adopted without amendment.

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(1) The English text remained unaltered.

Summary No. 11 :

11. Many reductions in passenger and good rates have been made by all the railway companies, especially in the case of short distance traffic up to 100 km. (62 miles) in certain cases, or for certain kinds of goods where there is competition.

The unequal conditions in which the railways stand as compared with motor transport in the matter of the obligation to transport and strict adherence to rates has obliged several Governments (Denmark, Holland, Switzerland, Czechoslovakia) to allow special agreements to be made between the railway and its clients for the permanent transport of fixed quantities of goods at reduced rates. This measure, applied on condition that the rates decided upon correspond to the reasonable cost of transport by motor lorry and assure the railway a profit compared with cost price, has proved efficacious.

We have an amendment to the last passage of the last paragraph, which has been proposed by Mr. Landra. Instead of : « This measure applied on condition that the rates decided upon correspond, etc », Mr. Landra proposes to say : « With regard to this, it is to be desired that the railway companies shall be authorised, by legal provisions to lower their rates to the level of those of their competitors when it is a question of retaining or developing either passenger or goods traffic. »

Mr. Colson (in French). — This point is dealt with in the addition I have proposed. It should not come in twice.

The President (in French). — Don't you think it would be best to add « has proved efficacious and *may be recommended* ».

Mr. Wasiutyński (in French). — Would it not be preferable to say : « and it appears to be worthy of general application. » In this way, we should advise the general application of this measure which some railways have already put into practice.

Mr. Landra (in French). — I should like the fact to be recorded by a statement.

The President (in French). — The proposal put forward by the Special Reporter is of a nature to satisfy you. After the word « efficacious » we shall add : « and it appears desirable to bring this system into general application. »

Mr. Le Besnerais (in French). — Rumania should be added to the list of countries.

The President. — That will be done.

Mr. Landra. — Italy, where the law authorises to do this, ought also to be added.

The President. — Very well. Italy will be added also.

— No. 11 is adopted with the accepted amendments.

We pass on to No. 12 :

12. Motor road transport has taken from the railways the monopoly of assuring rapid and economical communication between one place and another. The legislation concerning the railways, in force at present in different countries, does not take into consideration the great change which has taken place regarding them. It is to be hoped that these legal failings, one of the chief causes why road competition is often unfair, will be made good and that the use of a less stringent rating system on the railway will contribute to placing

road and rail transport upon an equal footing. By this means their close collaboration for the public good will be made possible.

Mr. Wasiutyński (in French). — Referring to what was said a little while ago, I agree to the word « unfair » being replaced by the expression : « prejudicial to the public interest » by saying « It is to be hoped that these legal failings, one of the chief causes why road competition is often *prejudicial to the public interest, etc.* »

Mr. Pellarin (in French). — It will also be necessary to strike out the word « often » which comes in front of « prejudicial ».

The President (in French). — We shall put, then, instead of «unfair » : « prejudicial to the public interest ».

I have also received a proposal emanating from Mr. Mayer and worded as follows :

« The present legal regulation of railways in various countries takes no account of the profound change in their situation and, amongst others, of the fact that certain administrations are still under the obligation of running a minimum number of trains on lines on which they are no longer justified by the common interest. »

Mr. Wasiutyński (in French). — I should have no objections to this proposal if I did not think that it enters too much into a question of detail. True, there are other points which it would be interesting to mention here, but I fear that in entering into these details, we shall weaken our summaries. In fact, it might be thought that these are the only legal failings which ought to be dealt with.

The President (in French). — In this connection, I would remind you that when Mr. Lamalle made a proposal in regard to No. 1, of an importance at least equal to this, we said that it was too special and it was rejected.

Mr. Mayer (in French). — In these conditions, I agree to withdraw my proposal but on condition that it appears in the minutes.

The President (in French). — That shall be done.

We now come to the proposal put forward by Mr. Colson and which eventually will become No. 13, the present No. 13 becoming No. 14.

« The Railway Congress emphasizes the fact that railways still constitute the most economical means of conveying bulk traffics over any distance, and for the transportation of goods in general over long and medium distances, and that it is to the public interest that such traffics should be retained by the railways. The railways have to contend with the following difficulties :

a) Taxation, in many countries in excess of that imposed on any other form of transport;

b) Legal and other obligations, which are often more injurious to the railways than beneficial to the public.

In order to avoid serious consequences, economic and financial, it is necessary to remove these two causes of inequality.

In regard to *a*), the Congress recommends that the various modes of transport be placed on an equal footing as regards taxation, the cost of road maintenance, and the amortisation of invested capital.

It is suggested that the contribution of motor transport towards road costs be collected in the form of annual taxes, either on the vehicles themselves, their fuel, or their tyres, as is already done in certain countries.

In regard to the second point *b*), the Congress considers that in view of the loss of the monopoly of long distance transport which the railways enjoyed before the development of motor transport, the present restrictions relative to the fixing of rates, and their date of operation should be so modified as to place the railways on an equal footing with their competitors.

The Congress considers that if this concession be made, the railways should organise lorry transport in order to give door to door services, similar to those of their competitors. »

Are there any remarks on the subject of this proposal ?

Mr. Ottone (in French). — I should like to thank Mr. Colson for his amendment to the original wording. This amendment acknowledges the economic function of all railways, irrespective of length, in conveying bulk traffic. For the other traffic, this function would be limited to long and medium distances. I have no intention of associating myself with this limitation and consequently I would prefer to delete from the proposal the passage : « in general over long and medium distances. » Actually, if we admit that goods in general may be conveyed in competition with motor transport and under more economical conditions over long and medium distances, this proposal must be interpreted as meaning that, for the transportation of goods in general, the motor is preferable when it is a matter of short distances. I do not think so. In fact, there are short distances and short distances. Besides, there are other factors to be taken into consideration. I do not wish to return to the general discussion, still I think that it would be preferable purely and simply to delete the whole of this proposal.

Mr. Colson (in French). — I insist on the text being retained as it is. It is the only cause of what follows. It is an obvious fact that the rail is the most economical means of transport over long and medium distances for goods in general. In the original wording, we only spoke of traffics in bulk over short distances. However, it should be stated that the railway is more economical, even over short distances, for goods in bulk. We have therefore added that these traffics in bulk are more economical by rail. But we cannot pretend that for traffics over short distances, the railway is often as economical as the motor. We should lessen our authority on all points if we appeared not to admit the superiority of the motor for most traffic over short distances.

Mr. Ottone (in French). — We cannot pass a resolution which would be a condemnation *en bloc* of the small railways for which only the poorer goods traffic is left. I insist therefore on the proposal being deleted, as I have asked. I also believe that this is of importance for the trunk railways because short distance consigments play a considerable part in their traffic.

Mr. Giovanola, Tessin Ry, Italy (in French). — There are short distances and short distances. There is a considerable difference in regard to this, accord-

ing to the country. You say that 50 km. (31 miles) are considered as a short distance, but there are a great many cases were the railway is more economical than the motor even over distances of less than 50 km. We cannot make an assertion that the companies operating on a limited distance ought to keep the poor traffic and give up the rich traffic. We must come to an understanding.

Mr. Colson (in French). — I think it possible to keep the traffics below 50 km. only exceptionally.

Mr. Giovanola (in French). — It may also be done as well over a distance of 30 km. (18.6 miles). It depends to a great extent upon special local conditions. The proposal cannot apply to distances of 50 km. and therefore I ask for this paragraph to be deleted.

Mr. Jourdain (in French). — Perhaps some distinction ought to be made. It is certain that we have secondary lines and even trunk railways who convey traffics over short distances. Perhaps it ought to be stated that, in certain cases, motor transport is perhaps more appreciated, particularly by the passenger, but it is not more economical.

Mr. Colson. — We are not speaking of passengers here.

Mr. Jourdain. — There might be confusion according to what has been said.

Mr. Colson. — There are special considerations for the passengers.

The President (in French). — I would remind you that we are dealing with goods traffic. According to what Mr. Giovanola has said, it may be admitted that, in certain cases, the transportation of goods may be more economical by rail than by motor, even over short distances.

Mr. Giovanola (in French). — In several cases, traffic is conveyed over distances of 20 to 30 km. (12.4 to 18.6 miles) and the clients prefer the railway. We have more than one line of about 30 km. long assuring frequent goods traffic of all kinds.

The President. — You assert then that the railway is more economical than the motor over distances of 20 to 30 km.

Mr. Colson (in French). — You say that it can be contended that for traffic over short distances the railway is more economical in many cases. It is obvious that if a railway company has a parcel to send, it will be sent by rail because it is a question of conveying it from one station to another. But when there are transhipments at each end, for carting, the use of the railways is more expensive.

Mr. Gilles-Gardin (in French). — Carting has to be done at both ends for large distances.

Mr. Le Besnerais (in French). — It cannot be denied that, in certain cases, the motor is a new means of transport. We must not forget to state an obvious thing, namely : that the motor exists.

Mr. Colson (in French). — We must not be told that we do not want to recognise the advantages of the motor ! There are many cases where the use of the railway is more costly for the total journey. We must therefore maintain this restriction.

Mr. Jourdain (in French). — In my

opinion, it is necessary to stipulate first of all that we are alluding to goods and not to passengers. The road is often more economical, for the public, by motor because this mode of transport offers certain facilities. It passes through the towns and villages and can convey goods to the place of destination itself.

We might say : « The railway is the most economical means for the transportation of goods in general, particularly for bulk traffics over short distances, etc. »

Mr. Ottone (in French). — I agree to the amendment proposed by Mr. Jourdain.

The President (in French). — There is a factor which we cannot ignore. We shall weaken our authority if we do not recognise that, in some cases, the motor is more advantageous.

Mr. Jourdain. — But not always more economical.

Mr. Gilles-Cardin (in French). — We could put « in general and particularly for railways of general interest ».

Mr. Giovanola. — I should like to hear the proposal read over again.

At the request of several delegates, Mr. Le Besnerais reads the proposal moved by Mr. Colson.

The President. — Suppose we put « in general » only.

Mr. Colson (in French). — If we put « the railways in general... », we recognise that there are cases when the motor is more economical.

The President. — I shall put to the vote the proposal made by Mr. Colson.

— Mr. Colson's proposal was approved.

We now come to the last summary which, since the proposal made by Mr. Colson has been adopted, will bear the number 14.

No. 13 of the special report, now becomes No. 14.

13. The information received from the railway companies themselves and other documents prove that motor road transport competition which has increased very much on certain railways by reason of local circumstances, has been sufficiently diminished by other companies by the speeding up and improving of railway transport, by the organisation of regular motor services as a subsidiary undertaking and by mixed services of direct transport as well as by other technical and rates measures of the railway companies supported by Governmental legislative measures.

Projects of legal reform with the object of regulating the obligations and expenses of the motor services and the lessening of certain fundamental railway obligations have been promised by several Governments.

These examples make possible the hope that motor road transport duly co-ordinated will become a powerful ally of the railway and assist in completing and developing communications to the greater profit of the public.

The Railway Companies and the Congress should be warmly recommended to study this problem further in order to attain such an end.

I consider that we may adopt this summary without discussion, while recommending the next Congress to study the question and to submit more explicit summaries.

— Approved.

The President. — Before closing the meeting, I should again like to express my thanks to the Delegates for the interest they have evinced in the study of this important question.

Mr. Mayer (in French). — I think I shall be voicing the opinion of the Assembly in thanking the President for the masterly way in which he has conducted the debates during this long and laborious meeting. *(Applause.)*

— The Meeting closes at 2.30 p. m.

Meeting held on the 8 May 1930 (morning).

3rd, 4th and 5th Sections meeting jointly.

MR. CRISPO, PRESIDENT OF THE 5TH SECTION, IN THE CHAIR.

In declaring the meeting open, the President pointed out that this new meeting had been made necessary because the publication of the summaries adopted at the meeting of 7 May had shown that certain amendments were necessary to the wording. The gentlemen chiefly interested, **Messrs. Colson, Wasiutyński** and **Zietschmann** had together drawn up the new text. Moreover, it would appear expedient to modify the subject matter of articles 1 (2nd paragraph) and 13.

— The formal amendments were adopted without discussion by the Meeting.

In regard to the subject matter amendments, the Sections decided, after intervention of **Messrs. Zietschmann, Landra, Beghin** (Departmental Rys., France) and **Desmedt** (Belgian National Light Railway Company), to point out the necessity for equality in the expenses borne by the motor and railway from the point of view of working hours and in the responsibilities imposed on the undertakings; moreover, the users ought to be assured that the motor transport undertakings are actually in a position to bear this responsibility.

— The Meeting decided the text of these additions.

As regards article 13, **Mr. Biraghi** had proposed a new wording, accepted by **Mr. Wasiutyński** and indicating that the the total cost by rail, including the expenses at present borne by the community, remains the most economical, irrespective of the distance.

Mr. Colson being of the opinion that, over short distances, motor transport is incontestably more economical, **Mr. Biraghi**, supported by **Messrs. Wasiutyński, Landra** and **Ottone**, specified that he only had in mind the portion of the transportation effected by rail, because he considered that the expenses of transport from door to station form part of the costs of production.

— The text proposed by Mr. Biraghi was adopted with an amendment taking these remarks into consideration.

The new text of the summaries, as adopted by the 3rd, 4th and 5th Sections was as follows :

SUMMARIES.

1. Because of the growing importance of motor road transport and its competition with railway transport, the common interest of both methods of trans-

port, as also public interest, require an exact appreciation of their respective values as regards communication as a whole and the coordination of their services.

To attain such an end, the present legislation relating to motor transport, which in most countries gives it the advantage over the railway, must be modified in such a way that motor transport may bear its full share of road expenses, and the public expenses of both methods of transport should be equally divided.

2. The system of free competition allowed in some countries, or the purely formal authorisation of regular motor services without regard to existing communications and without sufficient guarantee of the civil responsibility of the concession-holders, is not at all in the interest of the public.

The concession of regular motor services competing against the railway or other communications already in existence, which do not give the public any new advantages, should be prohibited.

Before granting authority, or a concession, for any regular motor service, the authorities concerned should be obliged to take into account the railways of the district and consult the owners thereof.

3. The indisputable advantages of motor transport, such as direct door to door services, operation by small units running frequently and rapidly, immediate organisation of a service with but little capital expenditure, are a valuable adjunct to the railway in many cases — services between stations, small and new traffic, tourist services, etc. — and everything points to the advantage of collaboration between it and the railway which is the best transport method for a great number of passengers and heavy goods.

To assure as far as possible a close collaboration between motor and the railway for transport as a whole, the railways should have the preference for obtaining the concession of regular motor services and take advantage of it.

4. Motor transport competition is especially found in short distance traffic [up to 50 and 100 km. (31 and 62 miles)] and lessens railway traffic to an extent that depends upon the importance of the motor service, legislation concerning it and other local circumstances. In the case of passenger traffic the losses are as much as 24 % of the receipts of the main lines and as much as 60 % for lines of local interest, and in the case of goods traffic as much as 10 %.

These figures include the losses due to the competition of irregular enterprises as well as cars and lorries owned by private individuals, which, in certain countries where motor traffic is highly developed, are much more important (four times as much in Germany) than the losses due to the competition of regular motor services.

5. The passenger fares of regular motor services are usually like those of 2nd class railway tickets, but in certain countries as much as 60 % higher, in others lower.

Goods rates also are regulated by the railway rates and for short distances are usually lower, but in some countries they are several times as high.

Such differences in rates prove that motor transport competition, especially in the case of passenger traffic, must in some cases be attributed to other than economic advantages.

6. To diminish motor competition the following improvements in rail transport have been carried out with good results :

a) Passenger traffic :

Organisation of local services of light and frequent trains formed of rail motor coaches and rail motor omnibuses on

lines where traffic is small, with provision for frequent stops between stations, organisation of through services on branch lines; organisation of cheap excursion trains on holidays; improvement of train connections at junctions and various timetable improvements; 3rd class sleeping cars and upholstered seats; luggage in advance, etc.;

b) Goods traffic :

Speeding up of transport by means of direct services and complete loads attached in certain cases to passenger trains; reduction of time spent on the journey and halts at stations; reforms in consigning of goods, especially in the case of parcels so as to facilitate their collection and delivery and the speeding up of their transport; more prompt forwarding of goods from transhipment stations; organisation of private depots for clients, etc.

7. Road arrangements to assure a complete door to door service for clients have been completed on certain railways under the form of motor and motor lorry services organised by the railway company itself or by means of agreements with private enterprises.

8. The use of containers which can be loaded onto both wagons and motor lorries is increasing rapidly on some railways and facilitates direct transport for small traffic.

The results of the international trials to select standard types might facilitate collaboration between rail and road.

9. A great many railway companies have organised or are organising regular motor services as subsidiary undertakings which are to act as feeder services or to run parallel with their own lines to relieve local congestion. Some of these railway companies (Pennsylvania Railroad — Great French Companies — Dutch Railway Companies — Swiss Federal Railways, Italian State Railways) have confided the running of their regular motor services as well as the cartage services and all business resulting therefrom, to companies organised as independent undertakings on capital provided by the railway. According to the information received these two types of subsidiary undertaking give promise of excellent results in the matter of the collaboration of road and rail and it is to be hoped that regular statistics will be established on this and other matters.

10. Mixed services of direct transport by railway and regular motor services belonging to the railway as well as other enterprises with possible choice of route have been organised by several railway companies in the United States as well as in certain cases in Europe. Such services seem likely to develop.

11. Many reductions in passenger and goods rates have been made by all the railway companies, especially in the case of short-distance traffic up to 100 km. (62 miles) in certain cases, or for certain kinds of goods where there is competition.

The unequal conditions in which the railways stand as compared with motor transport in the matter of the obligation to transport and strict adherence to rates have obliged several Governments (Denmark, Holland, Italy, Rumania, Switzerland, Czechoslovakia) to allow special agreements to be made between the railway and its clients for the permanent transport of fixed quantities of goods at reduced rates. This measure, applied on condition that the rates decided upon correspond to the reasonable cost of transport by motor lorry and assure the railway a profit compared with cost price, has proved efficacious, and it appears to be worthy of general application.

12. Motor road transport has taken from the railways the monopoly of assuring rapid and economical communica-

tion between one place and another. The legislation concerning the railways, in force at present in different countries, does not take into consideration the great change which has taken place regarding them. It is to be hoped that these legal failings, one of the chief causes why road competition is often prejudicial to the public interest, will be made good and that the use of a less stringent rating system on the railway will contribute to placing road and rail transport upon an equal footing. By this means their close collaboration for the public good will be made possible.

13. The Railway Congress emphasizes the fact that the rail remains the most economical form of transport having regard to actual cost, between the points it serves, and beyond that it is necessary in the public interest that railways should retain their traffic. Railways have to contend with the following difficulties :

a) Taxation, in many countries in excess of that imposed on any other form of transport;

b) Legal and other obligations, which are often more injurious to the railways than beneficial to the public.

In order to avoid serious consequences, economic and financial, it is necessary to remove these two causes of inequality.

14. The information received from the railway companies themselves and other documents prove that motor road transport competition which has increased very much on certain railways by reason of local circumstances, has been sufficiently diminished by other companies by the speeding up and improving of railway transport, by the organisation of regular motor services as a subsidiary undertaking and by mixed services of direct transport as well as by other technical and rates measures of the railway companies supported by governmental legislative measures.

Projects of legal reform with the object of regulating the obligations and expenses of the motor services and the lessening of certain fundamental railway obligations have been promised by several Governments.

These examples make possible the hope that motor road transport, when coordinated, will become a powerful ally of the railway and assist in completing and developing communications for the benefit of the community.

The Railway Companies and the Congress should be strongly recommended to study this problem further in order to attain such an end.

DISCUSSION AT THE GENERAL MEETING.

Meeting held on the 10 May 1930 (morning).

PRESIDENT : MR. JOSÉ GAYTAN DE AYALA.
GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.
ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary*. — We shall now proceed to discuss Question XIII. The first summaries relating to this question were published in No. 3 of the *Daily Journal of the Session*, but as a result of numerous discussions, these summaries have been modified and appear in the *Daily Journal* of to-day.

These new summaries have been scarcely changed as regards subject matter, it being mainly a question of formal amendments. The 3rd, 4th and 5th Sections fully agree to the new text.

Are there any remarks to be made as regards this new wording ?

Mr. Colson, Ministry of Public Works, France (in French). — At the beginning of summary 13 there are the words : « The Railway Congress emphasizes the fact that the rail remains the most economical form of transport having regard to actual cost between the points it serves. » These words : « The Railway Congress emphasizes the fact that... » have been taken from a first draft which was very detailed and dealt with numerous points which the Sections preferred to suppress.

I do not wish to return to the question of subject matter, only I am wondering if it is necessary to give this summary 13 a special importance, after the first twelve paragraphs, when the point under consideration is of mediocre interest, since it is merely a question of emphasizing the economical character of transport by rail, while the great strength of motor competition is precisely to avoid transhipment which cartage at the two ends implies and the additional journeys between the point of arrival and the stations.

I think that, after all, it would be better not to give this preamble to paragraph 13 since it appears to diminish the importance of the other summaries. It is merely a matter of form.

Mr. Wasiutyński, *Special Reporter* (in French). — Gentlemen, at the combined Meeting of the Sections, we endeavoured to explain why we particularly wanted certain statements of President Colson should be retained and allowed to remain among the other summaries.

In my capacity of Special Reporter, I consider it very important to have the Congress state ; « that the rail remains the most economical form of transport having regard to actual cost between the points it serves, and beyond, that it is necessary in the public interest that the railways should retain their traffic. »

It is a very important premiss for sum-

mary 12 : Road transport has taken from the railways the monopoly of cheap and rapid communication which they formerly possessed. Consequently, it is necessary to remedy this fault.

Since Mr. Colson remarks that this paragraph 13 is not necessary in its present wording, I must confirm that the Sections found, however, that this premiss was important, and that although it has appeared here under No. 13, it would be more suitable to put it as No. 12 and and No. 12 as No. 13.

Mr. Colson (in French). — I do not insist and I have no objections against paragraphs 12 and 13 being interchanged.

I think it regrettable to regard as a main point a very secondary point, because the strength of motor competition does not reside in the fact that motor transport is more economical between the points served by the railway; everyone knows that it is more expensive. The strength of motor competition resides mainly in the fact that the motor goes from door to door.

— Mr. Colson not insisting, the whole of the text of summary 13 was retained and the General Meeting adopted the inversion of articles 12 and 13.

Sir Josiah Stamp, London Midland & Scottish Railway. — I would like to point out that the French text of the 2nd paragraph of summary No. 3 does not correspond to the English text.

The French at present is as follows :

« Pour assurer autant que possible une collaboration étroite du transport automobile avec les chemins de fer, et pour les unir dans un plan d'ensemble de transport, les chemins de fer devraient jouir d'un droit de préférence pour obtenir la concession des lignes régulières d'automobiles. »

This text lacks the translation of the words : « and take advantage of it » which conclude the English text.

Further, this English text could be usefully modified, and a similar modification included in the French version.

For the English text, I would suggest : « for obtaining the concession of regular motor services, where they are prepared to take advantage of it. »

Mr. Wasiutyński. — I will confine myself to the remark concerning the last words of the second paragraph of summary No. 3 : « and take advantage of it », These words were deleted in the final wording which was drawn up jointly by Messrs. Colson and Zietschmann and myself.

We considered that they could be deleted. The English version retains them. It is the right of preference which is intended, and if the railways obtain the concession or authority, they may or may not take advantage of it.

Sir Josiah Stamp. — My point of view is, that it is perfectly possible for a railway company to obtain concessions with competition as the object, but that such concessions are not afterwards utilised. It would be better to say : « to obtain a preference for concessions as far as they are prepared to make use of them, and only on that condition; if they are not prepared to use them, they should not be given the concession. »

Mr. Colson. — Very good.

Mr. Wasiutyński (in French). — I take is that Mr. Colson considers that the end

of the 2nd summary « and to take advantage of it » should be reinstated.

Mr. Colson (in French). — I think that Sir Josiah Stamp's proposal is better because the question of knowing whether the railway will or will not take advantage of the service concerns it alone. What matters to the public is that if it asks for a concession, it will exploit it. It may exploit it at a profit or at a loss according to the case.

Mr. Wasiutyński (in French). — According to what I understand and what I know takes place in different countries, a concession which is not exploited loses its value. I therefore do not consider it necessary to add these words, but if Mr. Colson insists, there is no inconvenience in adding them.

Mr. Colson (in French). — One might say in French : « Dans la mesure où ils sont disposés à en faire usage ».

Mr. Wasiutyński (in French). — I propose to put « à même » instead of « disposés ».

The President (in French). — There being no objections, summary No. 3 will be amplified by the addition proposed by Mr. Colson.

Does anyone desire to make any further remarks regarding these summaries?

— No one desired to speak.

The President. — Here then are the

FINAL SUMMARIES.

« 1. Because of the growing importance « of road motor transport, and its com- « petition with railway transport, the « common interest of both methods of « transport, as also the public interest, « requires an exact appreciation of their « respective values as regards communi- « cations as a whole : also the co-ordina- « tion of their services.

« To attain this end it is necessary to « modify the present position of road « motor transport, which in most coun- « tries gives it an advantage over the rail- « way, to make road transport bear its « full share of the road expenses of « which it is the cause, of civil and com- « mercial responsibilities and of the pre- « scriptions in respect of hours of duty « of the personnel : in short that the « public charges shall be equally divided « between these two methods of trans- « port.

« 2. The system of free competition « allowed in some countries, or the pure- « ly formal authorisation of regular mo- « tor services without regard to existing « communications and without sufficient « guarantee of the civil responsibility of « the concessions-holders, is not at all in « the interest of the public.

« The concession of regular motor ser- « vices competing against the railway or « other communications already in exist- « ence which do not give the public any « new advantages should be prohibited. « Before granting authority, or a con- « cession, for any regular motor service, « the authorities concerned should be « obliged to take into account the rail- « ways of the district and consult the « owners thereof.

« 3. The indisputable advantages of mo- « tor transport, such as direct door to « door services, operation by small units « running frequently and rapidly, imme- « diate organisation of a service with « but little capital expenditure, are a va- « luable adjunct to the railway in many

« cases — services between stations, tou-
« rist services, etc., — and everything
« points to the advantage of collaboration
« between it and the railway, which is
« the best method of transport for large
« numbers of passengers and quantities
« of heavy goods.

« To assure as far as possible a close
« collaboration between motor transport
« and the railways for transport as a
« whole, the railways should have the
« preference for obtaining the concession
« of regular motor services where they
« are prepared to take advantage of it.

« 4. The competition of road transport
« is greatest over short distances [up to
« 50 or 100 km. (31 to 62 miles)] and
« causes the diminution of railway traf-
« fic, varying according to the number
« of the road vehicles and other circum-
« stances; cases have been stated in which
« this loss has reached 24 % of the pas-
« senger receipts of trunk lines, and up
« to 60 % of those of local lines, and
« 10 % of goods on trunk lines.

« These figures include the losses due
« to the competition of irregular enter-
« prises, as well as cars and lorries own-
« ed by private individuals, which, in cer-
« tain countries where motor traffic is
« highly developed, are much greater
« (four times as much in Germany)
« than the losses due to the competition
« of regular motor services.

« 5. The costs of passenger transport
« on regular lines of motor omnibuses
« are usually about the same as second
« class on the railways, but in certain
« countries they are 60 % higher, in cer-
« tain others they are lower than this.

« Goods rates for road transport are
« based on railway operations and are,
« for short distances, generally lower
« than the latter, but in certain countries
« several times greater.

« The diversity of these charges proves
« that the road transport competition,
« particularly for passenger traffic, must
« in some cases be attributed to causes
« other than economy.

« 6. To lessen road motor competition,
« the following improvements of rail
« transport have been successfully appli-
« ed :

« a) *Passenger traffic.*

« Organisation of local services of light
« and frequent trains in the form of rail
« motor cars for lines of light traffic,
« with provision for numerous stops
« between stations, organisation of direct
« through trains over branch lines; or-
« ganisation of trains at reduced cost at
« holiday times, improvement of train
« connections at junction stations, sleep-
« ing cars, and upholstered seats in third
« class carriages, delivery of luggage, etc.;

« b) *Goods traffic.*

« Speeding up of transport by means
« of direct services and complete loads,
« in certain cases attached to passenger
« trains; the reduction of time on the
« journey and stops at stations; reforms
« in the consigning of goods, especially
« of parcels, with the object of facilitat-
« ing their collection and delivery, and
« speeding up their conveyance; a more
« prompt forwarding of goods from
« transhipment stations; organisation of
« private depots for traders, etc.

« 7. Road arrangements for ensuring
« a complete door to door service have
« been completed on certain railways in
« the form of motor lorry services organ-
« ised by the railway company itself, or

« by means of agreements with private « undertakings.

« 8. The use of containers, which can « be loaded either onto wagons or motor « lorries, is increasing rapidly on some « railways and facilitates direct transport « for « smalls » traffic. The results of « the international trials to select stan- « dard types might facilitate collabora- « tion between rail and road.

« 9. A great many railway companies « are organising regular motor services « as subsidiary undertakings, to act as « feeder services, or to run parallel lines « to relieve local congestion. Some of « these railway companies (Pennsylvania « Railroad — the Great French Compa- « nies — Dutch Railways Companies — « Swiss Federal Railways — Italian State « Railways) have entrusted the running « of their regular motor services as well « as the cartage services, and the investig- « ation of questions connected therewith, « to companies that they have organised « as independent undertakings on capital « provided by the railway. According to « the information received these two « types of subsidiary undertaking give « promise of excellent results due to the « collaboration of road and rail, and it « is to be hoped that regular statistics « will be established on this and other « matters.

« 10. Mixed services of transport by « rail and regular lines of motor buses « belonging to the railways, or other un- « dertakings, with optional itinerary, have « been organised by several railways in « the U. S. A. as well as in Europe and « appear to be developing.

« 11. Numerous reductions of passen- « ger fares and goods rates have been « made by many of the railways, parti- « cularly for journeys up to 100 km. « (62 miles) for certain competitive traf- « fics.

« The unequal position of railways in « relation to road transport because of « their obligation to adhere strictly to « fixed tariffs has compelled several go- « vernments (Denmark, Holland, Italy, « Rumania, Switzerland, Czechoslovakia) « to admit special agreements between « the railways and traders for transport « at reduced rates, for a fixed period, of « agreed quantities of goods. This mea- « sure has proved successful so long as « the rates agreed on correspond with « the reasonable cost of transport by « lorry, and give the railways something « in addition to the actual cost. It ap- « pears desirable to bring this system « into general application.

« 12. The Railway Congress emphasizes « the fact that the rail remains the most « economical form of transport having « regard to actual cost, between the points « it serves, and beyond that it is neces- « sary in the public interest that railways « should retain their traffic. Railways « have to contend with the following dif- « ficulties :

« I. They are subjected to legal obliga- « tions or regulations of a very onerous « character.

« II. They are burdened in many coun- « tries with financial and fiscal charges « higher than those of any other mode « of transport.

« In order to avoid serious consequen- « ces, economic and financial, it is neces- « sary to remove these two causes of in- « equality.

« 13. Road transport has taken from « the railways the monopoly of cheap

« and rapid communication which they « formerly possessed in the localities they « served. The present legal regulation « of railways in the different countries « takes no account of the profound « change in their situation in this res- « pect.

« It appears to be necessary to lessen « the burden of this legislation, which « is one of the principal causes of suc- « cessful road motor competition, which « is too often prejudicial to the public « interest, also to make rating systems « more flexible in order to place railways « on the same footing as road motor or- « ganisations and to facilitate close col- « laboration between the various routes « to the profit of the common interest.

« 14. The information supplied by the « administrations, and other documents, « prove that the competition of road « transport, which is very serious on cer- « tain systems because of local circum- « stances, has been lessened on other sys- « tems by the improvement and speed- « ing up of rail transport, by the organ- « isation of regular lines of automobiles « forming auxiliary services and by mix- « ed services of direct transport as well « as by other measures, technical and « commercial, of the railway administra- « tions supported by government regu- « lations.

« Projects of legal reform with the ob- « ject of regulating the obligations and « charges of road motor services as well « as the easing of certain fundamental « obligations of the railways have been « reported by several administrations.

« These examples make possible the « hope that motor transport, duly co- « ordinated, will become a powerful ally « of railways and assist in completing « and developing communications for the « benefit of the community.

« With this end in view, the further « study of the question by the Adminis- « trations and by the Congress is strongly « recommended. »

QUESTION XIV.

USE IN RAILWAY WORK OF MACHINES FOR SIMPLIFYING STATISTICAL AND ACCOUNTANCY WORK.

Preliminary documents.

1st Report (America), the British Empire, China and Japan), by Mr. W. E. EPPLER. (See *Bulletin*, May 1929, p. 507 or separate issue No. 4.)

2nd Report (other countries, except Germany), by Messrs. BRUNEAU and BOISTEL D'WELLES. (See *Bulletin*, November 1929, p. 2499 or separate issue No. 37.)

3rd Report (Germany), by Dr. Ing. K. TECKLENBURG and Mr. GAIER. (See *Bulletin*, March 1930, p. 951 or separate issue No. 68.)

Special Reporter : Dr. Ing. TECKLENBURG. (See *Bulletin*, May 1930, p. 1493.)

DISCUSSION BY THE SECTION.

Meeting held on the 6 May 1930 (morning).

PRESIDENT : MR. MORENO, CONDE DE FONTAO.

The meeting opens at 9.30 a. m.

The President (in French). — To-day we have to discuss question XIV, the subject of which is becoming more and more important for the railways.

I call upon Dr. Tecklenburg to read his special seport.

Dr. Tecklenburg, *Special Reporter*, read his report together with the summaries he had evolved after analysing the different reports dealing with this question.

— The special report, as well as these summaries, was published in the English edition of the *Bulletin*, May 1930 (pages 1493 to 1503).

The President (in French). — I thank Dr. Tecklenburg for the excellent report he has just read to us. Now we will pass on to a discussion of the different summaries formulated by him. Has anyone any remark to make ?

Mr. Bruneau, *Reporter* (in French). — Mr. President, Gentlemen, I do not think any criticism of Dr. Tecklenburg's very remarkable special report possible; it is a very thorough report and it abounds in valuable information. My sole intention in addressing this meeting is to thank him for the care with which he has detailed the statements of the other reporters. But I should like to make a little remark on the subject of paragraph 8 of

the summaries. I wonder if it is not a little premature to consider the application of statistical machines to international commercial statistics (for, unless I am mistaken, it is such statistics that the Special Reporter has in view). I think that this, in effect, raises difficulties of two different kinds : first of all there are those of a practical kind which I admit are solved by statistical machines, while the second and most important concern the establishment of a uniform nomenclature for goods. I do not object to expressing our hopes in this matter, but I wish to stress the fact that besides the mechanical difficulty, which, indeed, is solved by these machines, there are difficulties of a totally different kind, the greatness of which we are not at present in a position to appreciate.

Dr. Tecklenburg (in German). — In answer to Mr. Bruneau's remarks, I will simply say that the point of view expressed in paragraph 8 of the summaries was in my mind simply a glance at the possible future evolution of the question. It goes without saying that at the present time there are still difficulties which make the realisation of these ideas impossible. I had considered in the first place the possibility of collaboration in discounting the letting out of stock (common user). Adjoining railways would in this way be able to economise by exchanging perforated cards. It would in this way be only necessary to perforate half the number of cards, either at the start of finish of the journey. Furthermore, to my mind, it does not seem impossible that some combined action could be arranged in the domain of traffic statistics. Without having any very definite ideas concerning the practical form that such co-operation could take, I think that the perforated card system might be applied to consignment statistics, and in consequence to certain kinds of traffic that are now the subject of detailed statistics, which would make the drawing up of such statistics considerably easier. I think that if some sort of international collaboration were inaugurated, it would doubtless be applied to those fields where it is most easy to arrive at some common agreement as to the necessary definitions and where goods can most simply be designated by numbers.

Mr. Hondl, Czechoslovakian State Railways (in German). — May I be permitted to say that the Czechoslovakian State Railways have this year started mechanically drawn up statistics with regard to three traffic relations, Hollerith machines being used; the first two relations are with Czechoslovakia and Poland, and with Austria and Hungary respectively; on the other hand, last month we started conversations with the Altona and Dresden Directorates of the German State Railway Company with the prospect of shortly holding a meeting for drawing up statistics of the relations between Germany and Czechoslovakia. We do not deny that there will be difficulties about this; first of all the numbering must be discussed. Already to-day, there are, in the tariffs, certain categories of goods that are identical, so that it is now a question of contriving to have the stations numbered uniformly, so as to make it possible to exchange perforated cards or to use them reciprocally. I just wished to mention these difficulties, but, as you see, Czechoslovakia has already embarked upon realising that evolution we may expect in the future when machines will be employed to simplify statistical work.

Mr. Bruneau (in French). — After

these explanations, I do not insist upon a modification of paragraph 8 of the summaries.

The President. — Does anyone else wish to add anything ?

Mr. Bruneau (in French). — Apart from the subject of the summaries, I should like to ask Mr. Tecklenburg for further information about the experiments made in Germany concerning the use of statistical machines for accounts and commercial statistics. I should like to know if the results of these experiments were encouraging ?

Mr. Gaier, *Reporter* (in German). — On the 1st January 1926 the Reichsbahn embarked on the experiment of using perforated cards for the commercial accounts of goods traffic in five districts : Stuttgart, Elberfeld, Francfort, Karlsruhe and Mayence. The perforated cards used for the accounts also served for drawing up the statistics. These experiments are now finished and have led to the conclusion that it will doubtless be possible to make the process simpler and more economical. In the meantime, attention has been concentrated on the question of applying some more economical system to the small package category with transport costs of up to 5 Reichsmark. Experiments are being carried out in this matter, but are not yet finished.

Mr. Hondl (in French). — I should like to add that the Czechoslovakian State Railways, since 1928 and in some cases since 1927, have successfully drawn up by means of Hollerith machines, statistics concerning the staff. We find that there are many advantages in this method. This year we have already drawn up statistics relating to the staff of our eight directorates, and we have been able to draw up statistics which it would not have been possible to do by hand.

Mr. Bruneau (in French). — Dr. Tecklenburg's report states that on the German Railways, an extensive use is made of ticket printing machines; we are well acquainted with such machines and probably many of our colleagues are. But I do not think such an extensive use is made of such machines in any other country. It would be interesting to know whether the advantage the German Railways have derived from the use of such machines is due to definite economies resulting therefrom, or is essentially a question of the indirect kind such as greater convenience and better service.

Mr. Gaier (in German). — The ticket printing machines in use on the Reichsbahn are very economical. The accounts are made up very quickly; the staff have finished their work as soon as the booking office is closed.

However, more difficulty is experienced in drawing up the statistics of the passenger traffic. To make it easier to draw up these statistics, the ticket printing machines have been furnished with counting mechanisms (sorting counters), which work every time a ticket for a fixed category of traffic or a fixed class is printed. This counting mechanism has already become a definite part of the ticket printing machines supplied recently.

Mr. Baillargués, Paris-Orleans Railway (in French). — I would like a little further information. As Dr. Tecklenburg states in his report, one of the reasons which justify the use of counting machines is the economic advantage, these machines making possible a saving in

staff and time. For this reason — especially as far as the statistics of expense are concerned — the use of counting machines of the Mercedes, or other types, which have in general been satisfactory, has been resolved upon.

As for the ticket printing machines, two factors come into play. The first is the resulting monetary economy, *i. e.* the possibility of rapidly paying for the machine by the savings due to the reduction in the staff; but the indirect advantages are also a factor to be considered, such as, for example, the rapid delivery of the tickets of which Dr. Tecklenburg was just speaking, or the facility given for the passing on of services from one shift to another, or the possibility of installing a greater number of ticket distributers in a restricted space. It would be interesting to know if the result of the use of these machines has been of particular advantage from the economic point of view only, *i. e.* as regards a decrease in expenses, or if it is rather a question of the indirect advantages of which I have just spoken : facility of exchange of service, rapidity in the distribution of tickets, installation in a restricted space, which decided the Reichsbahn to use machines for issuing tickets.

Finally, I wish to ask one last question: do these machines, in their present form, give complete satisfaction at the present time ?

Mr. Gaier (in German). — The advantages of ticket printing machines are apparent as I have already said, in the matter of accounts. The accounts are prepared in a very short time; whereas in former times the staff employed took 2, 3, or 4 hours to draw up their accounts, they can now finish them in a few minutes.

When such detailed statistics as those drawn up in Germany (receipts divided between the various districts of the Reichsbahn) are not required, ticket printing machines without sorting counters suffice. The Reichsbahn establishes a distribution of the receipts between the different districts and for this purpose has recourse to detailed statistics for the tickets issued according to their station of destination and class. These statistics necessitated an increase in the staff and consequently in expense when they were drawn up with ticket printing machines without counting mechanism, and in this way the advantages obtained by using such machines for accountancy work were partly lost. The new ticket printing machines give the information required for these statistics by means of the counting mechanism. With these new machines it can be exactly determined every evening how many tickets were issued for the different stations and in the different classes.

Mr. Newton, London and North Eastern Railway. — I should like to know the name of the machine introduced in Germany which supplies the basis for accounting detail, which has always constituted, in my opinion, the greatest difficulty. When I was in Germany, I was impressed by the advantages of the ticket printing machines. The A. E. G. machines are being installed on the London and North Eastern Railway and I hope that they will be ready for Whitsuntide.

Mr. Gaier (in German). — The Reichsbahn uses A. E. G. and Siemens-Halske ticket printing machines. Up to the present an equal number of these machines has been ordered from each of these two firms. The quality of the work done by them is the same.

There is great rivalry between the two firms who continually try to improve their machines. One of them had hardly invented the new counting mechanism, before the other was also employing it, so that the two types of machines are always on the same level.

The President (in French). — I think that we can consider the general discussion as ended.

Does any one else wish to ask for any further information, or to present any remark about the text of the summaries proposed by the Special Reporter ?

— No one wished to say anything.

The President (in French). — We may therefore consider the proposed text as adopted; the discussion on Question XIV is finished.

It remains for me to offer my thanks to the Delegates who have thrown new light on this important subject by the information they have supplied us.

DISCUSSION AT THE GENERAL MEETING.

Meeting held on the 10 May (morning).

PRESIDENT : MR. JOSÉ GAYTAN DE AYALA.
GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.
ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary.* — We now pass on to question XIV. The summaries relative to this question, adopted by the 4th Section, have been published in the *Daily Journal of the Session.*

Has any one any remark to make ?

Mr. Bruneau, *Reporter.* — I would like to make a very slight modification in the French text in connection with a word which does not seem to me to express exactly the idea of the Special Reporter and the Meeting, and so might give rise to misunderstandings on the part of those who had not read the reports.

It concerns the second sentence in paragraph 7 of the summaries where it says: « Les avantages des machines consistent en ce qu'elles permettent d'exécuter *les* travaux plus rapidement... »

Taken literally, this wording might give rise to the opinion that the Congress favours a very general use of statistical machines, while all those who have studied the question, and the Reporters if they are present will agree, know that usefulness of statistical machines is limited to work of a certain complexity.

Therefore I would like to replace the words « *les* travaux » by the words « *certains* travaux ». This would get rid of the general character of the statement, which was not noticed in the course of the discussion by the Section.

The President. — Are we agreed upon the introduction of the proposed modification ?

Dr. Tecklenburg, *Special Reporter* (in German). — I have no objection to make as regards this alteration to the wording. The German text will naturally have to be altered in consequence.

Sir Henry Fowler, *Assistant General Secretary.* — I also associate myself with the new wording. The English text, of course, will be made to agree with the modified French text.

— No other objections were raised.

The President. — The summaries are therefore as follows :

« 1. The efforts to make the operations « necessary for the carrying out of cor- « respondence, accounting and statistical « work more economical, are a part of « the great question of measures to be « taken for rationalization. The objec- « tive may now and then be reached by « pure and simple rationalization, but « more generally by rationalization « coupled with mechanization.

« 2. In order that when choosing the « means, the appropriate ones may be « selected, it appears worthy of recom- « mendation, that every Administration

« should set up a special department « whose duty should be to investigate « uniformly the basic questions concern- « ing rationalization and mechanization « and which, with its accumulated know- « ledge, should stand behind the detach- « ed departments in an advisory capa- « city.

« 3. The common axiom governing « mechanization should be : The intro- « duction of office and similar technical « apparatus is justified when, after tak- « ing into consideration purchase and « high amortization costs due to rapid « depreciation, savings are made or in- « direct advantages, such as the quick- « ening or improving of work, are « gained such as will offset the costs.

« 4. Accurate judgment on the econ- « omic results of mechanization presup- « poses the existence of comparative ac- « counting. The prompt production of « the costs incurred by the introduction « of machines and the working out of « the costs of mechanical methods should « therefore have careful attention.

« 5. The degree to which machines are « occupied has considerable influence on « the cost of mechanical operation. The « policy of keeping the machines fully « employed is therefore of the utmost « importance in the organization of the « work; in many cases, the centraliza- « tion of work will be a preliminary step.

« 6. The office machines, mechanical « installations and similar apparatus at « present to be found in the use of the « railway administrations, are of extra- « ordinary diversity; on account of the « continued progress in this sphere, each « administration must in future choose « in the light of the common point of « view previously developed, the ma- « chines which are best suited to its « particular needs and operations; an « interchange of ideas at a latter date is « to be recommended, on the experience « accumulated, especially that concern- « ing machines built solely for railway « purposes such as ticket printers and « the like.

« 7. An advance of the very greatest « importance in statistical and account- « ing operations is to be seen in the in- « troduction of machines for statistical « purposes (the so-called perforated card « machines). Their advantages lies in « the possibility of carrying out certain « investigations more rapidly and more « accurately and in the possibility of « deepening the researches and opening « up fields of enquiry which could not « be reached by purely manual methods. « Enquiry is therefore possible into « questions which, up till now, have « been closed to investigation, especially « on the economic side, and this makes « possible the elucidation of important « scientific problems regarding railway « operation (cost problems).

« 8. The wider general introduction of « the perforated card system will provide « advantageous possibilities for interna- « tional co-operation, especially in the « matter of reciprocal accounting and « perhaps for the question of interna- « tional traffic statistics. It is recom- « mended that developments in this « direction shoud be watched, and that « later, at the appropriate time, they « should form the subject for further « discussion. »

QUESTION XV.

CO-OPERATION OF THE STAFF TOWARDS INCREASED EFFICIENCY AND ITS PARTICIPATION IN THE PROFITS.

Preliminary documents.

1st report (America, the British Empire, China and Japan), by Mr. C. C. Cook. (See *Bulletin*, July 1929, p. 1125 or separate issue No. 12).

2nd report (Belgium, France and their Colonies), by Messrs. Soulez and Bloch. (See *Bulletin*, November 1929, p. 2533 or separate issue No. 38).

3rd report (other countries), by Messrs. R. Marin del Campo and J. Canovas del Castillo. (See *Bulletin*, January 1930, p. 215 or separate issue No. 55.)

Special Reporter : Mr. R. Marin del Campo. (See *Bulletin*, May 1930, p. 1504.)

DISCUSSION BY THE SECTION.

Meeting of the 8th May 1930 (morning).

President : Mr. MORENO, Conde de FONTAO.

— The Meeting opens at 9.30 a. m.

The President (in French). — Gentlemen, in accordance with our programme, to-day we have to discuss Question XV.

Mr. Marin del Campo, the *Special Reporter*, will speak first.

Mr. Marin del Campo (in French). — Mr. President, Gentlemen, I will try to be as brief and concise as possible in the statement I am going to make, persuaded as I am that those who will take part in the discussion will have already thoroughly studied the problem in question and made themselves familiar with the three reports as well as with my special report.

This latter is made up of five parts, the 2nd, 3rd and 4th being summaries, or rather extracts from the three reports dealing with Question XV. The 2nd part is an extract from the report of my French colleagues and friends, Messrs. Soulez and Bloch, whose report was lengthy, detailed, full of valuable information and truly remarkable, though in my opinion somewhat fragmentary as it was confined to a single one of the many aspects of Question XV that were deserving of study, and above all, of co-ordination.

The 2nd report which I summarised was that of our North American colleague, Mr. Cook. This report, while

just as remarkable as the French one I have just spoken about, differs from the latter in being very short. On the other hand, instead of dealing with the matter in a fragmentary fashion like Messrs. Soulez and Bloch, Mr. Cook has studied it from a general point of view, *i. e.* he has considered nearly all those aspects which to my mind should be considered, examined and above all co-ordinated.

Finally the third report which I drew up with the help of my colleague and great friend, Mr. Canovas del Castillo, was inspired by the same leading ideas as Mr. Cook's work, and furthermore includes two aspects he did not consider, which we thought of great importance, i. e. on the one hand the study of the matter in question not only as regards the present but also the past and the future, the near future of course; on the other a study of the political, social, and economical ideas which in principle can be adopted as regards the railway industry, as also a study of the different political, economical and social ideas of each country, a study which in my opinion should be made at the same time to enable it to be judged to what extent it is possible and fitting to introduce in each country under consideration, into the practical affairs of each individual railway administration, the institutions and rules which seem to be the logical outcome of those ideas that, at least at first sight and theoretically, seem to be the best, i. e. the nearest to the ideals of truth, justice and progress.

At present, I think it would be useful if I gave you a clearer idea of the first and of the fifth and last parts of my special report which are very concise and synthetical. I will therefore read these to you, so that those who are not familiar with these reports and the special report may be able to follow the ensuing discussion with profit.

— **Mr. Marin del Campo** then read the first part entitled : *Introduction.* « *Object of this special report* » and then the fifth part entitled : « *General summary and conclusions* ».

He also recalled the summaries at the end of the report he drew up in collaboration with **Mr. Canovas del Castillo**, and which appeared in the *Bulletin* for January 1930, p. 239, and May 1930, p. 1523.

He continued as follows :

Gentlemen, I wish to make a few more remarks before I end this report because it is a very incomplete report if the complexity, amplitude, diversity and importance of the subject we have to discuss are considered.

To sum up, the subject matter includes the general problem of the co-operation of staff of all categories, the final object of such co-operation being the ever-growing prosperity of the railway industry, and this the more so that the detailed enunciation of Question XV which I formulated (1) and propose should be inserted in the agenda of the 4th Section at the next Congress, can be summarised, or rather synthetized in

(1) This enunciation was as follows (cf. the *Bulletin* for May 1930, p. 1525) :

Methods used in the « past » and in the « present », and methods which could be used staff of all categories of the railways their co-operation with the greatest efficiency in the growing prosperity of the railway industry, taking into account the different politico-economic « conceptions » which can be adopted in principle in the railway industry, and in view of the different politico-economic-socialistic conditions of each country.

these words : « Co-operation of the staff ». Under this heading, « Co-operation of the staff » and the detailed enunciation I proposed, we should study a somewhat large number of aspects of the railway field, such as co-operative meetings, suggestions schemes, professionnal training and instruction, organisation of work, wages, system of premiums and bonuses, safety measures, stores for the staff, and many other institutions, methods, processes and measures, etc., aspects which should be examined in a *general* fashion but not in detail. Indeed, if the Congress decides to study in detail the numerous questions relating to the staff, such as : wages, premiums and bonuses, organisation of work, safety measures, etc., it should study these singly under the appropriate headings, but when it is a question of the more general heading : « Co-operation of the staff », the Congress must be supposed to have already studied in detail all these particular cases of the problem of the co-operaion of the staff, and therefore it has now to limit itself to considering these from the point of view of ensemble, co-ordination and harmony, so as to solve the special problem of combining them in such a way as to ensure the free, conscious and perfect co-operation of all categories of staff in the growing prosperity of the railway industry. This prosperity should not only be that of the employers, or that of the employees, manual or intellectual, or of the general public, but of all three, since these are the three human factors in the working of a railway and as such all equally deserving of consideration, esteem and affection.

To recapitulate, it is a question of the special problem of co-operation, *i. e.* of a combination of given factors, or supposedly given factors, for the attainment of a common object. It is a question of not stopping at the analytical study of each of these factors : premiums and bonuses, organisation of work, professional intruction and training, etc., but of determining the influence of each of these and of a combination of them, in the life of the railway. Finally, it is a question of a general problem in the sense that it includes many other particular problems supposedly solved; but at the same time it is a question of a special problem in the sense that it is specifically of the psychological, sociological, organical and humanitarian order all at once.

Mr. President, Gentlemen, such is the aspect under which I view this important question, and I thank you for the patience with which you have followed the expounding of my theme.

The President (in French. — Has any one any observation to make ?

Mr. Soulez, *Reporter* (in French). — Gentlemen, our friend, Mr. Marin del Campo has perfectly defined the point of view from which we studied Question XV. Our report does indeed deal with one very definite aspect of the question. We considered that this was the aspect under which it might best be examined for the whole of the railways. Therefore we drew up our report by studying the two points designated to us : co-operation of the staff towards increased efficiency, and participation in the profits. We think that if the question were to be considered from a more general point of view, many other factors should have been included, the first that comes to my mind being the question of rationalisation; this perhaps will

be included in the agenda of some future Congress. It would also be necessary to speak about professional training, a matter on the agenda of the present Congress. The question of social work might also be considered, though, at least as regards lodgings, this formed part of the agenda of the 1922 Congress at Rome. It would also be fitting to deal with the question of pensions. These are only the chief of all these questions. It is indeed a great and complex problem ! Therefore, we deliberately put aside all those generalities which might form the subject of special studies in technical reviews. We endeavoured to supply the Congress with information on various points and certain aspects of the question set.

In our report, we began by summarising very briefly the ways in which the problem of remuneration has cropped up during the last century, at a time when the conditions of labour have become more and more complicated and, consequently, more and more complex measures are required. There remains the problem of co-operation towards increased output *i. e.* the result of the work of a definite entity, and that of participation in the profits, *i. e.* the sanctioning of an improvement in the general situation of the enterprise employing the staff in question. We attempted to so deal with the question that for each of these parts everyone might profit by the experience of each individually, and as a result we evolved a certain number of summaries which could be discussed at the present Congress.

The President. — Mr. Djouritchitch will now speak.

Mr. Djouritchitch, Ministry of communications, Yugoslavia (in French). — I am very much obliged to the Special Reporter for having considered Question XV from a very broad point of view, and also for insisting that it should be maintained on a high level. Personally, I find that in following his ideas my horizon has been widened. So the sole object of the considerations I wish to bring forward is to provoke the Special Reporter into giving us some further information which will enable us to link up his opinions and the matter of his last proposal with what is already familiar to us.

If it is easy to understand the usefulness of an intelligent collaboration between all grades of staff to increase the output, the question of participation in the profits needs further elucidation.

First of all we must get rid of the idea of a net profit to be shared in. The net profit of a railway is much too vague a thing. Only the profits due to an improvement in the output of certain kinds of work can reasonably be divided up. But even so, such a division will present various difficulties in view of the interests concerned.

In considering all the interests concerned in the exploitation of a railway, a distinction must be made between :

Those of the owner and the operator, who supplied the neccessary capital, who have to bear the risk of depreciation and working deficits. These capitalists must not be disencouraged;

Those of the State that granted the necessary concessions and bears important charges due to the existence of the railway and demands in return that it shall be run in the interests of the public;

Those of the public who require a certain standard of service at rates it can afford;

Those of the staff who lend their services to the undertaking against payment, it is true, but who nevertheless deserves special attention and not only for reasons of a social order; its selection, training, and the best output that can be obtained from it call for special action.

All these interests have a financial side and are often in conflict. The management of the undertaking should direct all the means at its disposal towards obtaining a better output so as to give the maximum of satisfaction to the above mentioned interests. When it is a question of dividing up the expenses or the net profits of its efforts on behalf of these interests, its liberty is very restricted in the matter, and this may have an important influence on the output.

In order to take all the interests concerned into account, it is necessary to solve, under given conditions, an equation with several variables. The classical school, which Mr. Marin del Campo mentions with some disdain, tried to find for the railways the best possible solution from the general point of view. The Special Reporter proposes as our object « the maximum efficiency in the growing prosperity of the railway industry ». Therefore the main question has a more restricted basis than that considered by the classical school; is the object of this to arrive at more practical results than in the past ?

Should the expression « methods » as employed in the enunciation of Question XV as proposed by the Special Reporter be understood as something belonging to the administration of railways only, or is it a question of those means which should be prescribed by the State, or further still, of those which should be the object of an individual or collective contract ?

I have no proposals to make, my sole intention being to obtain before the discussion begins more definite explanations from the Special Reporter concerning the precise meaning of his last enunciation of the question.

Mr. Bloch, *Reporter* (in French). — Mr. President, Gentlemen, as Mr. Soulez has just said, both of us are entirely in agreement on the way in which Mr. Marin del Campo views the final object of our labours. But actually we are confronted with a very definite programme, so that it is for the Section to judge if we carried it out in a satisfactory way. I think it necessary to explain why the French reporters chose an objective method which, though it has great advantages, may seem to some a little bit dry and lacking in humanity.

First of all there was a programme to be kept to : that of the Permanent Commission who chose a very definite and precise question. If the members of the Permanent Commission has wished to enlarge the matter to be discussed and set a more extensive problem, there was nothing to prevent them from doing so. They might have set the problem in its full extent under the form : social rationalisation, instead of restricting the discussion, if I rigthly understand the words employed, within the simpler expressions : premiums for output and participation in the profits.

In France we have the habit of giving words their exact sense. One celebrity was accustomed, whenever he began a debate with anyone, to begin by asking him : « What is it about ? »

In the same way, for us it simply was about premiums for output and participation in the profits. Moreover, another reason made us restrict our work to this programme.

One of the promoters, certainly the most important in Europe, of the question of scientific organisation of work who made the name of Taylor familiar this side of the Atlantic, I refer to the great French savant Henri Le Chatelier, insists that those who occupy themselves with these very extensive questions must be careful not to lose themselves in generalities. Here are more or less his words : « Generalities are found everywhere and they have very little influence on the advancement of science. The study of details, the bringing to light of partial truths, is, on the contrary, what makes possible by sure stages, to increase human knowledge, and this is what science should concern itself with. »

All of us, as railway experts, are endeavouring to extend the conquests of applied science (not only as regards mechanics, and physics, but also in administration, sociology, and political economy). Each one contributes his bit to the common fund. In the end accumulation of details forms a whole from which humanity can benefit.

This is why I am convinced that the most useful work we can do in this case is to furnish the definite constitutive parts of our common labour, rather than to give general estimates of what the termination of the work will reveal.

If I am not wasting too much of your time I should like to quote another example. I have the honour of belonging to a certain number of national and international scientific societies that specialise in questions of scientific organisation of work : the French National Committee for Organisation, the International Committee for the Scientific Organisation of Work, and finally the International Institute for the Scientific Organisation of Work, of Geneva. Well, in short, are not these the sort of societies that might be tempted always to study big problems, to throw out big ideas, to stir the world by general considerations ? If you consider the means they employ in their efforts to interest peoples and countries, you will see, on the contrary, that it is always by precise examples, by details, by an accumulation of examples taken everywhere, that they force the whole world to see that the problems they are studying must of necessity be considered.

I think the questions we are concerned with to-day are of the same order. The result of our work should be to enable every member of the Congress to obtain the maximum of information on the results obtained by some of the members whose work has led them along paths the others have not explored.

Therefore to conclude, I will simply state that if we are quite in agreement with Mr. Marin del Campo as to the object which we all have to keep in view, an object that unfortunately is still somewhat remote, we insist on the need there is at the present moment, in view of the immensity of the track still to be covered before the objective is attained, of accumulating information, of accumulating experience, and in short of letting everyone profit by the experience acquired by each individual in his special field of study.

Mr. Jacquet, Ministry of Public Works, France (in French). — Mr. President, Gentlemen, first of all I must ask you to excuse me for addressing this meeting at all; I am only a simple representative of the staff on the Upper Council of the French Railways and for this reason the Ministry of Public Works of my Country commissioned me to take part in this

Congress. I will be very brief and not waste too much of your valuable time.

I simply wish to say that I entirely agree with the summaries evolved by the Special Reporter.

I think, in effect, that this question is not at all a question of mathematics and algebra. Above all it is a question of psychology. I would go so far as to say that it is a question of humanity. From the practical point of view perhaps the staff is not enormously interested in the question of output premiums, which is not to say that it does not take an interest in the management and smooth working of the railway by which it is employed. On the contrary, it knows very well that its wages will always, when all is said and done, depend on these factors. The staff, especially the management staff which I have the honour to represent, wish for a close, as close as possible, collaboration with the railway administrations, not with the object — which has sometimes been ascribed to them — of little by little taking all the management into their own hands, but simply with the object of contributing as far as possible to a better working of the railway, and to its ever increasing prosperity. This is the reason why I entirely agree with the summaries of the Special Reporter who asks that this co-operation shall be more and more an integral part of the agenda of the Congress, in such a way as to make it quite definitive.

Mr. C. T. Cramp, Ministry of Transport, Committee on Safety Appliances (Great Britain). — This question seems to me to be allied to the question of the *Training of staff*, which follows it, and it is difficult to keep them apart.

Co-operation of staff is essential and there is a great deal to be done to obtain the goodwill of the staff in order to make the railways efficient. There is a genuine desire on the part of the staff for goodwill and this desire should be made effective.

The tradition has been that men have left such matters in the hands of their officers, but in these days of Road Transport Competition it is more than ever necessary to secure the co-operation of the staff, who should have the difficulties placed before them by the management as they are at present unaware of them.

Railwaymen have pointed out to me where traffic had been lost and I have referred them to their supervisory officers, but the men have been timourous that their suggestions would not be favourably received.

The efficiency of the railways depends upon the understanding of the staff, and all matters which pertain to the efficiency of the various systems and render them proof against their competitors, should be explained more fully to the employees.

This is against the tradition of the past, and it is not everywhere the desire of the headquarters of the railways nor the wish of local officers.

I think that the difficulties of the railways will diminish when the staff fully understand them, and every help should be given by the managements and officers to explain to the staff how much can be done to make the railways paying concerns and efficient.

Mr. Bloch (in French). — I am entirely in agreement with Mr. Cramp on the point he has raised. Questions of collaboration are indeed of the highest importance and, particularly as far as the French railways dealt with by Mr. Soulez and myself in our report are con-

cerned; if we has wished to describe what was happening in the matter of collaboration on the different French railways in the different grades of employement, we should evidently have extremely interesting things to report. Whether it be a question of discussions between the heads of departments when the higher grades of employees are concerned, or of suggestions put forward by workmen and employees of the lower grades, or of interviews between the management and representatives of the staff, there is very extensive collaboration on the French railways.

But according to the wording of the question, it is a matter of output premiums and participation in the profits. If an increase in output and the means of assuring this had been on the agenda of the present Session of the Congress, there would have been an open field. A great deal might have been said; all the questions of collaboration about which we, the French reporters, have comprehensive information and which we consider extremely important, might have been brought up. But, once more, we did not so much as mention these because they were not the subject of the present discussion.

However, we are always at the disposal of the Section to supply any additional information that may be required as a result of our report.

Mr. Pretorian, Rumanian State Railways (in French). — Mr. President, Gentlemen, in my opinion the question of the treatment of the staff of railways can be divided into three more or less distinct parts.

1. First of all the general treatment of the staff which includes the wages paid for work done, such wages evidently depending on the position of the staff, the situation of the country to which the railway belongs, and on local circumstances. In this category also are included the premiums paid to the staff for extra work done, *i. e.* an increase in wages corresponding to an increase in time of work.

2. In the 2nd category may be included those measures taken by railway companies to gain the interest of the staff. By this I mean the organisations concerned with social and medical aid, pensions and savings banks, the establishment of co-operative stores, etc. Many of these measures are of such a nature as to ensure the interest of the staff because of the advantages they may expect from a good general and social organisation.

3. Finally there are those measures intended to incite the staff to work harder and so increase the output. In this category I include the premiums paid to the staff for improved output per unit of time, apart from the increased production due to work carried out by working overtime.

Such measure as facilitate work and reduce costs directly contribute to greater profits.

As a particular example I will mention the case of the State railways. When, at the close of the financial year, the accounts reveal a net working profit, a reduction in the rates is at once considered, under pretence that these are very high and have therefore contribued to the profits in question. In this way the staff is deprived of its share in the increased profits, a share which is only its due in view of its intelligent and hard work which has played a large part in the favorable financial result by which, in the end, the users of the railway have benefited.

A reduction in rates must be considered when there are large profits, but at the same time the contribution of the staff towards earning these profits must be borne in mind. For this reason the law which allowed the Rumanian State Railways to become self-governing stipulated that 25 % of the net profits of each year should go to the staff. As to the way in which these profits are to be divided up, that is the business of the railway to decide.

Mr. Barth, French State Railways (in French). — I should like to add a little to what has just been said. If I rightly understood it, in Mr. Marin del Campo's opinion, Question XV is a question of a general order, concerned at one and the same time with the organisation of work, profit sharing and even the training of the staff.

As Special Reporter on Question XVI, I gave some consideration to these points, and I must say that I do not at all agree with Mr. Marin del Campo. In reality, I consider these three questions absolutely distinct, though of course there is a close connection between them.

I would even go further than Mr. Bloch, who seems to have confused the question of the organisation of work with that of profit sharing; in effect, in every case, the organisation of work, should precede the setting to piecework and the premium paid. Even by itself it gives valuable results, even if the staff is not encouraged to increase its output by the possibility of additional earnings.

As I tried to show in my report, first of all the best working methods must be decided upon : this is the question of organisation. Then the staff must be taught these methods : this is the question of the training of the staff; and finally by different means the staff can be encouraged to work harder by being allowed to share in the profits. This latter, if rightly understood, is the question with which we are now concerned, and I consider that the French reporters understood the problem exactly when they reduced it to an examination of the different formulæ by which this participation can be brought about.

Mr. Poirel, Ministry of Public Works, France (in French). — Mr. Marin del Campo read us a little while ago the following detailed enunciation proposed as the title of Question XV : « Methods used in the « past » and in the « present », and methods which could be used in the « future » so as to obtain from the staff of all categories of the railway their co-operation with the greatest efficiency in the growing prosperity of the railway industry, taking into account the different politico-economic « conceptions » which can be adopted in principle in the railway industry, and in view of the different politico-economic-socialistic conditions of each country. »

Gentlemen, we will therefore consider the problem as a psychological one, and we will not consider the organisation of the railway without the participation of the staff in its administration.

Why ? Because, if, on the one hand, you have the capital which assures this administration, on the other the staff is represented by the work done. Now if railway employees are thrust out from the administration of the railway you will never be able to modernise your enterprise.

We request that nothing should be undertaken in this matter without the co-operation of the staff and its syndicates.

Mr. Biscoe (North Western Railway of India). — I wish to speak from experience in India and hope I will not be repeating anything that has been said in French, with which language I am not conversant.

In India, the difficulty is to get the staff to understand the real conditions, as 75 % to 90 % of them are natives and only the officers are English. Up to 85 % of the men are illiterate, and as there are seven different languages the question of co-operation is extremely difficult.

Perhaps a delegate from Belgium, or another Administration with native staff, will be able to explain how they get co-operation with their staff.

Mr. Bloch (in French). — In order to answer Mr. Barth, I will simply point out to him that we have put the question of the participation of the staff in the profits and in output in its place as a special development of the organisation of work.

In order to place the matter, I ask that the following lines from the end of our report should be read :

We think it useful to briefly indicate the processus of the operations to which the railways who have taken into hand this investigation, have been led :

a) Setting up of an industrial accounts office to ascertain the indirect charges;

b) Modification of the establishment by a carefully thought out specialisation of the management staff;

c) Detailed investigations into each operation in a unit of production so as to find without taking into account previous practices, the methods leading to the greatest output and to the lowest cost price;

d) Exact definition of the condition of work in each particular case, so that the methods, tools, speed, etc... of each operation, shall be completely defined;

e) Investigation into the time to be allowed for each of these operations, taking into account the precise conditions laid down as above :

f) After completion of the preceding investigations and with the certitude that the results to which they have led cannot be surpassed by improvements which are in the control of the management, introduction of output premiums.

The President (in French). — Mr. Marin del Campo will now answer the previous speakers.

Mr. Marin del Campo (in French). — It would indeed be difficult to answer all the speakers and all the different points of view revealed. Interesting things have been said, but I must confine myself to taking up the more important points raised.

Nearly all the speakers have raised the question as to whether we have really understood the enunciation : « Co-operation of the staff towards increased efficiency and its participation in the profits. » Gentlemen, I do not think I am mistaken if I state that this is the most important question of the lot. Naturally all these questions about the definitions, wording, etc., are somewhat philosophical and all kinds of interpretations are allowable. There are good reasons for defending black, and white, and even red. One fact emerges : each of the reporters drew up his report according to his own way of seeing the question.

However, I will take the liberty of employing an argument *ad hominem* as the saying is in logic. There were three

groups of reporters : the French reporters, the Spanish reporters, and the American reporter. Two of these three groups, the American and the Spanish adopted the same point of view and understood the question in the same way, the only difference being that we, the Spanish reporters, studied the question somewhat more extensively. I do not at all wish to imply that the greater number are always in the right; sometimes a single person is right in opposition to everyone else. But this is the beginning of my argument.

Likewise I wish to say that quite recently, from 28 April to 3 May, a Congress of the International Federation of Transport Workers was held at Madrid, and among other questions that of the participation of the staff, increased output, etc. figured on its agenda. Mr. Lambert was the reporter. Five or six other delegates took part in the discussions, which I followed with great interest. I have the summaries here. The proceedings were more interesting than the conclusion. Those who took part in the Congress made no secret of the fact that before they drew up their reports, Mr. Lambert and the others, and before they discussed the question, they studied our three reports and my special report in order to get more light on the subject so as to be able to come to better and more weighty conclusions. They found that there were two interpretations of the subject : « Co-operation of the staff towards increased efficiency and its participation in the profits », that of Messrs. Soulez and Bloch, and the radically different interpretation of Mr. Cook, Mr. Castillo, and myself. Well, they followed the interpretation of Messrs. Cook and Castillo and myself, no doubt because our arguments seemed more convincing to them than those of the French reporters.

Furthermore, I have had the opportunity during these last few days of discussing the matter with Mr. Bloch and other delegates, and my chief feeling is that the matter is far from exhausted and it would be useful to recommend further study of it.

Mr. President, Gentlemen, in order to settle this dispute, I think it would be well to ask the 4th Section if it does not think that this question might be referred back and included in the agenda of the next Congress. This is the first point I should like you to decide.

Secondly, if the Section is in favour of referring it, it must decide at the same time in what way it wishes the question to be studied : whether in agreement with my conclusions which are the same as those of Messrs. Castillo and Cook, the International Federation of Workers, as well as that of many of the delegates, or as Messrs. Soulez and Bloch understand it.

I think that these are the first two points which should be settled, and I beg you, Mr. President, to ask the Section what its opinion is in the matter.

The President (in French). — We have therefore to decide the two following points :

First of all, does the Section think that the question has been sufficiently studied to make it possible to take any resolutions or to evolve the summaries —to be set before the Railway Congress ?

Secondly, should the Section itself draw up the new formula under which the question is to be studied, or should it leave this to the Permanent Commission ?

I submit these two points to the Section:

Are there any observations ?

Mr. Grimpret, Ministry of Public Works, France (in French). — I am entirely in agreement with the Special Reporter's point of view. I think that the very fact that certain reporters understood the question differently from others, shows that it was not very clearly worded.

On the other hand, my opinion is that the question : « Co-operation of the staff towards increased efficiency and its participation in the profits » is only a means to the end : the co-operation of the staff. The staff should take part in the increase of output and share in the profits, not only to increase their earnings but to attain the more important and higher ideal of co-operation. Therefore I second the Special Reporter's proposal and recommend the Section to vote as follows : the question has not been very clearly worded and should be reexamined.

Mr. Djouritchitch (in French). — Personally in the present case I do not consider it necessary to vote on a somewhat incomplete matter. In any case it comes to this : if we decide that the question should be reexamined, then at the same time the heading under which it is to be studied must be fixed. On the other hand there are two ways of understanding the problem and both of them have been thoroughly gone into, so that I think we might very well examine and discuss them one after the other.

Mr. Marin del Campo (in French). — On the contrary, I think all the aspects of the problem should be studied under a single heading. The principle that only one question can be discussed when a single conclusion is required must be borne in mind. The Section cannot sanction dissimilar summaries. Therefore we must determine the exact meaning of the heading : « Co-operation of the staff towards increased efficiency and its participation in the profits ». It is really a very delicate question, since it entails the prestige of the Railway Congress.

Forty-one years ago, in 1889, the 3rd Session of the Congress held in Paris broached this question for the second time. It was first examined at the 2nd Session at Milan, in 1887.

At this latter Session, in 1887, there was a similar clash of opinions, and Mr. Ambrozovics, of the Hungarian Railways, proposed — just as we have done — to refer the question and include it in the agenda of the next Session requiring it to be fully studied from a different point of view.

The Milan Congress decided to put off the question till the next Session. It also decided to have only one reporter. (At the present time there are 3, 4 or even 5 reporters, but then there was only one). The Permanent Commission chose Mr. Ambrozovics as reporter, and he drew up his report for the following Session (Paris 1889). Mr. Ambrozovics was the first to raise — and much credit is due to him for it — all these questions of psychology, sociology and organic principles. Forty-one years have elapsed, but many of the things said to him then have been brought forward by certain delegates now.

It seems to me that certain speakers blame us, Mr. Castillo and myself as well as Mr. Cook, for having considered the question in a somewhat concrete way, urging that it is necessary to be precise

and to report accurately upon facts. The very same criticisms were made to Mr. Ambrozovics in former times.

May I be allowed to cite as another example Mr. Ford who, in his method of industrial exploitation, has made use of every formula, even the most extreme, but not as regards the question with which we are now concerned.

Now, I do not think that anyone would call Mr. Ford an unpractical dreamer. Everyone knows that he has been extraordinarily successful in manufacturing motor cars. Then the « Ford Motor Co. » bought a small railway in the United States, and Mr. Ford has contrived to manage this railway without formulæ nor mathematics. « Leaving mathematics out of the picture, are the general principles of administration, and organisation, the psychological, sociological, organic and humanitarian principles which I have made use of in my motor industry also applicable to the railway ? » asked Mr. Ford. He found that they were. The rules of administration are, in his opinion, three in number. « The first is to carry out the work in as direct a way as possible, taking no account of formulisms, nor of any of the usual divisions of authority; the 2nd, to give good wages — at least 6 dollars a day — demanding in return 48 working hours per week, but not more; the 3rd is to keep all machinery in the best possible condition, keeping it always on the same level, and insisting on absolute cleanliness everywhere, so that all may learn due respect for their tools, working-places and out-houses, and themselves. » With these formulæ, which are not mathematical formulæ, he organised a railway which, as he has said, proves his theories, because, though relatively small, it holds the foremost place in the States by reason of its staff, administration and wages. The minimum salary Mr. Ford pays a workman is greater than the average salary paid by the largest railway of the United States. It has proved an extraordinarily successful plan, and perhaps in the end it will be the one generally followed in a few years. In short, Mr. Ford has learnt how to organise a railway as a corollary of experience acquired by him in the motor industry.

As I showed in my report, I can conceive of three ways of apprehending industrial management. I might call these the classical conception, the socialistic conception, and the harmonic conception. In every industry one must first of all be absolutely definite about one's object, so as to be able to establish likewise the object of the co-operation of the different factors concerned in the working. It was for this reason that I gave you all these preliminary considerations on the general conception of industry.

In conclusion, I would like to draw the attention of the Meeting once more to the two points I proposed to the Section which the President read a short while ago.

Mr. Soulez (in French). — In the course of a lengthy discussion many extremely interesting points have been raised, but I think that Mr. Marin del Campo has summarised these with extreme conciseness.

What is the matter in question ? Is it the *co-operation* of the staff in increasing output and profits, or is it their *participation* in these ? Question XV is headed : « Co-operation of the staff towards increased efficiency and its participation in the profits. » It was there-

fore upon this heading that we took our stand. It is but a part of a more general question, but it was the part set and to which we gave our attention : the participation of the staff in increasing the output and in the profits; not the question of co-operation. Though I do not deny the interest of the information supplied, it seems to me that all the members of the Section are agreed that the co-operation of the staff is indispensable, but nevertheless the question set was : « Co-operation of the staff towards increased efficiency and its participation in the profits. »

Though perfectly in agreement with Mr. Marin del Campo as to the importance of the question of co-operation, I maintain that the question with which we are now concerned is : « Participation. »

Mr. Marin del Campo (in French). — In fact we are faced with two different currents of opinion; one part of the Assembly considers Messrs. Soulez and Bloch interpreted the question very well when they studied the matter of premiums and bonuses; others in the like way think that Mr. Cook and I interpreted it correctly. This brings all discussion to a dead end and I think the matter should be put the vote.

Mr. Bloch (in French). — Would it not be possible to obtain a solution pleasing to everyone if we only discussed the aspect of the question that I dealt with in collaboration with Mr. Soulez ? Afterwards we could extend our enquiries to the more general questions, it being understood that whatever was not dealt with at this Session shall be carried over to the next.

Could not this proposal be adopted ?

Mr. Marin del Campo (in French). — My reply to Mr. Bloch is that if we limit ourselves to the summaries of Messrs. Soulez and Bloch, we should be discussing the conclusions they arrived at because of their particular conception of the problem and the way in which the matter was set before the French and Belgian railways, which are certainly very important, but nevertheless only a fraction of all the railways of the world.

Now it is the object of the Congress to arrive at general conclusions that can be adapted to every railway and not merely to those of two countries.

Mr. Pretorian (in French). — I quite agree with Mr. Marin del Campo that the question has not been fully studied and so must be retained on the agenda of the next Session of the Congress and then studied from every point of view. The point of view adopted by Mr. Marin del Campo and his American colleague differs from that of the French Reporters; but each report is full of valuable information by which we can profit when evolving the summaries and making the recommendations needed for the future.

Therefore I beg Mr. Marin del Campo to consider whether, when formulating the question to be set before the next Congress, the following points of view should not be taken into account : first of all the measures to be taken by railway administration to gain the interest of their staff (this I think should be insisted upon); next the means by which the staff can be stimulated to co-operation; and also the best means of ensuring that the staff works under the best conditions so as to obtain the best possible output, and to act in such a way that the staff shares in the profits according to the measure in which it has contributed to obtaining these.

Mr. Marin del Campo (in French). — In my opinion Mr. Pretorian's second point, the co-operation of the staff, is the real question with which we are concerned, because it is the most general. Moreover, the point about measures to be taken to gain the interest of the staff can be included in it.

Mr. Pretorian's third point belongs rather to the special question of the organisation of work and is also joined up with the second point. Therefore these three points of view can perfectly well be combined in one single question, the question of co-operation.

A little while ago, I spoke of the object of co-operation and briefly recalled the definitions of the three different conceptions of industrial management about which I spoke at length in my report.

They are three very different conceptions, and therefore I ended my report by directing the reader to Reports N°s 1, 2 and 3. With all this store of information : Report N° 1, by Messrs. Soulez and Bloch; Report N° 2, by Mr. Cook; and Report N° 3, by Mr. Castillo and myself, each country and each railway administration taking part in the next Congress should be able to examine the question as a whole.

The President. — The first thing we must decide on in my opinion is the definition of the principle involved.

Mr. Bloch (in French). — Mr. President, I hope you will excuse me for holding forth once more, but I should not like an impression to be left with our colleagues that we are faced with two tendencies : one frankly humanitarian, the other frankly mechanical. Therefore I should like to read part of the summaries of the French report that show absolute agreement with what Mr. Marin del Campo has said :

In some cases it has been thought sufficient to codify the methods in use and to fix the figure for the production according to the results that these methods make it possible to attain.

Certain undertakings have endeavoured to arrive at greater accuracy when fixing the production rates after which a premium is due, and have not been satisfied to adopt the methods of working confirmed by custom. They have carried out a systematic investigation into the processes giving the greatest efficiency. They have in this way been automatically led to take into consideration the question of the scientific organisation of work, and to recognise that their studies should, to be logical, precede — as we have pointed out in our precis — that of the premiums for efficiency.

Therefore we clearly indicated that the general questions that have been raised should logically precede that of the organisation of premiums for efficiency. But, this being granted, would it not be possible, always with the object of meeting the requirements of this Session, to state that the question of premiums for efficiency has been dealt with in the spirit I have indicated to you, i. e. explaining very clearly that it is but a detail that in point of time should come later than various other questions, all these being reserved for further inquiries.

Mr. Marin del Campo (in French). — In reply to Mr. Bloch, I must state that I never intended to make such a distinction. In reality the difference is as follows : Messrs. Soulez and Bloch considered the question from a partial point of view while we considered it from the general point of view.

. One of the Secretaries has just proposed, in order to clear up the matter, that paragraph 2, page 1523, of my special report should be taken as a summary :

If the 4th Section considers that the preliminary study of Question XV is not sufficiently ripe for its deliberations to have the full effect desirable, as it did in the session of Milan 1887 for its question XXI, the same subject should be included anew in the questionnaire of the next session of the Congress, as it was decided then. It may be that there would be to-day better and stronger reasons for proceeding thus, seeing that the movement of modern ideas in the matter in question is much wider, more intense and more accelerated than at that time.

adding the following lines :

The 4th Section recommends the Permanent Commission, in view of a greater co-operation to have the title of this question worded with greater detail, so that the exact extent of the matter to be studied under it will be more clearly defined.

I think that if this proposal was approved, we would imply by it that the 4th Section had not been able to define the question for itself. Now, I still think that it would be better if the 4th Section itself defined the meaning of the heading : « Co-operation of the staff towards increased efficiency and its participation in the profits ».

I ask the Meeting to express its opinion on the matter.

The President (in French). — Does the Meeting think that this point has been sufficiently discussed and is sufficiently understood by everyone, to enable us to take definite decisions that can be submitted to the General Meeting, since there are at least two dissimilar opinions on the meaning of the participation of the staff in increasing the output and in the profits ?

Are we agreed to say that the matter is not ripe enough for summaries to be evolved, and that in this case it must be submitted to further study ?

Mr. Soulez. — In this case will the question be put off till a later Session ?

Mr. Djouritchitch (in French). — I agree that the question is not ripe enough, provided that in the statement of the fact it is added that as the reporters differed in their interpretations all the railways were not answering the same questions, with the result that insufficient information was received about each aspect of the question.

Mr. Minsart, *Principal Secretary.* — The President asks the opinion of the Section on the following text for the proposal :

« The study of this question is not sufficiently advanced for any summaries to be evolved and the Section recommends that the question should be included in the agenda of the next Congress. »

Further, we will take into account Mr. Djouritchitch's proposal concerning the different interpretations of the reporters and the consequent gaps in the answers received from some of the railways.

The President. — Different speakers have proposed that the matter should be put to the vote.

Mr. Soulez. — Mr. President, would it not be better to break up the meeting for a short interval, so that a definitive text might be drawn up.

The President (in French). — There is no inconvenience. The Section must be cognizant with the text read by the Principal Secretary.

— The Meeting adjourned at 11.15 and re-opened at 12.15.

The President. — The Principal Secretary will read the new text.

Mr. Minsart (in French). — Gentlemen, here is the text of the proposal on which the President will require you to vote. It was drawn up on the proposal made by one of the members of the Section and amended by Mr. Djouritchitch :

« The Fourth Section finds that the Question has been interpreted differently by the reporters, with the result that the replies received from the various Administrations do not contain sufficient data to form the basis of definite conclusions. In these circumstances the Section recommends that the Question be investigated further and placed on the Agenda for the next Congress. »

The President. — We will discuss the meaning of this text bye and bye, or else to-morrow.

Mr. Bloch (in French). — May I be allowed to submit another text which I have worded as follows :

« The 4th Section finds that Question XV has been studied in the three reports from different aspects. Therefore it will confine itself during the present Session to a study of the part relative to premiums on output and participation in the profits.

« On the other hand it recommends that the question should be included, under a heading to be decided upon, in the agenda of the next Congress. »

Mr. Grimpret (in French). — The question is not entitled : « Premiums on output. » This is where there is equivocation. If there were premiums on output, I would absolutly agree with Mr. Bloch, but it is a question of the « participation of the staff ». One might as well propose to discuss the question by completely altering it.

Mr. Bloch. — In any case it is the way in which one of the reports was drawn up.

Mr. Pretorian (in French). — The form in which the questionnaire was elaborated did not throw sufficient light on the question; some railways did not reply. Under these conditions we cannot to-day discuss the question of profit sharing. We have not got sufficient information and the whole question should be retained on the agenda of the next Congress. In short, we must agree why we have recommended further study of the question.

Mr. Bloch (in French). — Obviously the question must be restudied as a whole. But is it necessary to waste all the labour expended on it up to the present ? Because, in point of fact, what has already been done is sufficient for the exchange of interesting points of view. For example, I might mention work carried out on certain railways in order to interest the staff in the administration of marshalling-yards.

Mr. Pretorian (in French). — In order to get more light on the subject, I asked Mr. Marin del Campo for certain information. He proposed an enunciation of the question under a very general form, but I put the question to him as follows :

Suppose we have obtained by prede-

termined means the co-operation of the staff. Let us grant that this co-operation has given the best possible results, that output had been increased and that in the course of the year the receipts have been greatly in excess of the expenditure, so that it has been possible for the company to grant the staff all sorts of benefits. At the end of the year this company when making up its accounts finds that there is a net profit. Then the question crops up as to whether or not the staff, apart from all the benefits received during the year, has any right to share in these profits, which most often are due to its efforts. In what way and in what measure is the staff to share in these profits ?

Therefore I asked the Special Reporter to introduce this idea of the participation of the staff in the net profits into the question set for the next Congress.

The President (in French). — This question can be discussed to-morrow if you like. For the present we should come to an agreement about the proposal just read. To-morrow we might first of all consider whether the Section itself should draw up the enunciation of Question XV or whether it should be left to the Permanent Commission.

Mr. Pretorian (in French). — In my opinion the Section should formulate this enunciation, not the Permanent Commission.

Mr. Minsart (in French). — I will read the text of the proposal once more.

« The Fourth Section finds that the Question has been interpreted differently by the reporters, with the result that the replies received from the various Administrations do not contain sufficient data to form the basis of definite conclusions. In these circumstances the Section recommends that the Question be investigated further and placed on the agenda for the next Congress. »

Mr. Pretorian (in French). — I propose that the words « under the following form » should be added to this text.

The President (in French). — We will discuss the wording of the question at to-morrow's meeting.

Does the Section agree about the proposal just read by the Principal Secretary ?

— This proposal was adopted.

— The meeting ended at 12.30.

Meeting held on the 9 May (morning).

PRESIDENT : MR. MORENO, CONDE DE FONTAO.

— The Meeting opens at 9.30 a. m.

The President (in French). — Gentlemen, to-day we will continue the discussion on Question XV which we voted yesterday should be retained on the agenda of the next Congress.

This morning we must decide on the wording of this question, *i. e.* indicate the concrete points that must be kept in view in studying it, based on the general subject of the co-operation of the staff towards increased efficiency and its participation in the profits.

Mr. Marin del Campo, *Special Reporter* (in French). — Mr. President, Gentlemen, yesterday after discussing the purport of Question XV most thoroughly, we found we had to come to conclusions on two definite points : the first was to decide if the question was to be put off until to next Session of the Congress; and the second, to determine the exact formula under which this question should be enunciated. The Section almost unanimously decided to include the question in the agenda of the next Congres.

Therefore, today, we have to determine the exact formula under which this question shall be enunciated in the questionnaire of the next Session.

As you will have noticed, there are two main tendencies in this matter : on the one hand, that represented by the French Reporters, and on the other, that represented by the American and Spanish Reporters. Side by side with these two points of view, there is also Mr. Pretorian's proposal to take into account the subordinate question of the participation of the staff in the profits, as well as several suggestions put forward by other delegates.

In view of all this, and after some conversation held after yesterday's meeting with a select few, the President, animated by his great desire to find a conciliatory formula, asked me to come and talk with him yesterday afternoon.

The President suggested that I should modify the end of my special report, taking into account the two following principles established by him :

1. To take into account all the tendencies manifested by the Section in the course of yesterday's discussion; and

2. To act in such a way that this consideration of the points of view of all the speakers does not lead to any sacrifice, or cutting short of the opinions of the other side.

This was an extremely hard problem; but nevertheless I think I have found a solution that will satisfy all the different points of view.

Naturally the proposed formula had to be made to agree with the text of the resolution adopted yesterday.

Before reading it to you I must congratulate the President once more on his conciliatory attitude; he has spared himself no pains to find a solution pleasing to everyone as regards this much debated question.

Here is the text which we propose for the approval of the General Meeting :

« Question XV : Co-operation of the

staff towards increased efficiency and its participation in the profits. »

PROPOSED SUMMARY :

The Meeting, after examining Reports Nos. 1, 2, and 3 on Question XV « Co-operation of the staff towards increased efficiency and its participation in the profits » drawn up by the North American Reporter, Mr. Cook, the French Reporters, Messrs. Soulez, and Bloch, and the Spanish Reporters, Messrs. Canovas del Castillo and Marin del Campo, as well as the special report of the last named, and as a result of this examination and of the discussions of the 4th Section, state :

1. That the enunciation of Question XV: « Co-operation of the staff towards increased efficiency and its participation in the profits » has been interpreted in very different ways both by the reporters and the Assembly in general, so that it was in consequence impossible to unify the various summaries evolved by each of the above mentioned groups of Reporters;

2. That this impossibility was partly made up for by the abundance of instructive points of view contained in the three reports in question, as well as by the conscientious way in which the different aspects of the problem have been examined by the authors of the above mentioned reports, all of which leads the Meeting to recommend strongly to railway administrations a thorough study of the works in question;

3. That the report of Messrs. Soulez and Bloch might serve as a model and might also be useful as a whole or with a few small modifications as far as Belgium, France and their Colonies are concerned, for the universal study of a question which might be included in the agenda of the next Session of the Congress under the following title and sub-titles :

« Premiums, bonuses and participation of the staff in the profits of the railway. — System of premiums, bonuses and participation of the staff in the profits, so as to incite it to co-operate with the railway in order to increase its output and consequently their profits »;

4. That Reports Nos. 1 and 3 by Mr. Cook, and Messrs. Canovas del Castillo and Marin del Campo, as well as the special report of the last named and the results of the discussions of the 4th Section on Question XV, also incline the 4th Section to suggest to the Permanent Commission the idea of including in the agenda of the next Session a question with the following title and sub-title.:

« Co-operation of the staff : Methods used in the « past » and in the « present « and methods which could be used in the « future » so as to obtain from the staff of all categories of the railways their co-operation with the greatest efficiency towards the growing prosperity of the railway industry, taking into account the different politico-economic-socialistic « conceptions » which can in principle be adopted as regards the railway industry, and the different politico-economic-socialistic « conditions » of each country. »

5. If the Permanent Commission, which is free either to accept or reject the two proposals contained in paragraphs 3 and 4 above, accepts them, the Assembly thinks that the Reporters nominated afterwards should not draw up any detailed questionnaire but should content themselves with recommending to the member administrations the study indicated in paragraph 2, so that these administrations

shall have at their disposal enough information to assist them in forming their judgments, in view of the nature and structure of their respective reports.

The President (in French). — Has any one any objection to make to this text ?

Mr. Bloch (in French). — The Special Reporter told us a short while ago that we were face to face with several tendencies. I should like to make it clear that there are no tendencies. The French Reporters considered that they had only to carry out a definite programme; this was the one traced for them and they carried it out. If another one is given them they will carry it out in an equally objective way.

I think that an impression has been left by yesterday's meeting that the French report is more objective and mechanical, and the Spanish report is more humanitarian. I insist that the French Reporters always do what is required of them without indulging in any tendencies.

Mr. Marin del Campo (in French). — I beg Mr. Bloch to excuse me if the expression « tendencies » used by me is too absolute. I simply meant to refer thereby to the two ways of treating the question.

The French report is in fact concerned with a single point, whereas ours constitutes a more general study of the question.

Mr. Bloch. — I thank the Special Reporter for his explanation.

Mr. Pretorian (in French). — Gentlemen, before you give your opinion on Mr. Marin del Campo's proposal, I should like to raise two points.

It has been suggested that the business of drawing up the enunciation of the question which is to be set before the next Congress should be left to the Permanent Commission. I maintain what I said yesterday : that it is the business of the Section itself since it has discussed the matter in detail..

Next I consider Mr. Marin del Campo's proposal somewhat too general.

Before I knew that a formula had been drawn up for the question to be set, I myself evolved a text which I should like to submit to you.. Perhaps you will find therein useful elements which you will be able to take into account during the discussion on the text proposed by Mr. Marin del Campo.

The question, as I formulated it, is somewhat long, precisely to please the Special Reporter, but it could be shortened.

« Participation of the staff in the profits, bearing in mind the different aspects of the problem of the treatment of the staff, according to modern principles, in the course of the year, so as to obtain from it a harmonious and as complete as possible co-operation in order to obtain the maximum of output (with the minimum of expenditure) and the progressive prosperity of the railway administrations, at the same time assuring those who make use of the railway a transport service under the best conditions at a low rate. »

— The two proposed texts were then translated and the meeting adjourned at 10.30.

— The meeting reopened at 11.0.

The President (in French). — Gentlemen, we will continue the discussion.

You have had opportunity to get acquainted with the two proposed texts. At the present our task is to elaborate the definitive text to be submitted to the General Meeting.

Mr. Soulez (in French). — Gentlemen, I wish to make a small observation about point 3 of the Special Reporter's text. It seems to me that this paragraph might be worded more simply yet with the same meaning, as follows :

« Premiums, bonuses intended to interest the staff in increased output and its participation in the profits. »

Yet another point; we had, in fact, a particular question to study at this Congress; but to our great regret we find that, as the question was considered from different aspects in the three reports, it is not possible to deal with it. As it is an extremely interesting subject we naturally all wish it to be dealt with in a latter Session. Under these conditions, I think it would be fitting *for us to establish* a precise and limited programme of the questions to be submitted to an investigation, so as to give each Reporter a definite frame for his work, a frame *he must keep within*. This programme can be as extensive as the 4th Section desires. But it seems to me that this time it is indispensable to define definitely, and in a way that makes any confusion impossible, the limits of the investigation demanded. This seems to be a difficult task to accomplish at a meeting, so that I think perhaps it would be better to choose some of our number to carry it out, and then in a short while we could meet again to examine the programme prepared in this way.

Sir Josiah Stamp, London Midland & Scottish Railway. — Now the text has been revised the words « profit sharing » have a much more definite meaning, and I propose the substitution therefore of the words « Other forms of interest in results ». In England « profit sharing » includes holding of stocks, etc. Also with regard to « Systems of premiums », I consider Mr. Pretorian's suggestion is unnecessary, as it is already covered by paragraph No. 3 of the proposed summary.

The President. — Are there any other objections to Mr. Pretorian's formula as read during the first part of the meeting?

Mr. Pretorian (in French). — Gentlemen, may I be allowed to explain my motive in proposing this formula, because in my opinion, which is not that of the Special Reporter, only a single question should be set, one that is capable of including the entire idea.

On the other hand the Special Reporter's proposal says that the object in view is : « to increase their output and their profits. » Now, the object of our institutions is not merely to increase the profits, nor the receipts simply, but also to give complete satisfaction to those who use the railway, by assuring acceptable conditions of transport. In order to do this there must be profits, since if the thing was run at a loss it could not satisfy these conditions.

Then there is paragraph 4 containing the formula of the : « Co-operation of the staff. » The words in this formula are in my opinion too long, « politico-economic-socialistic... of each country. » It must not be forgotten that the questionnaire has to be sent to various railway administrations many of them being State owned railways, and that all these are invited to send in their answers. Now here the question of political conditions is raised. Would a State railway administration wish to take the responsibility of disapproving its country's politics, or care to answer a question likely to raise difficulties between it and its government ?

I assure you that if I had to answer this question I would certainly avoid mention of the politics and economics of my country.

Therefore I think that these words should be replaced by others which would enable the railway administrations to answer the whole questionnaire, and afterwards to draw from it, by means of the reports drawn up and the summaries evolved, those recommendations which will be the most acceptable for the future, within the limits which we set ourselves.

Not only am I against sub-dividing the question, but I propose to join the two questions in a single one, including everything, except the words I have just spoken about.

Mr. Bloch (in French). — Mr. Soulez proposed the nomination of a Committee to draw up the programme to be submitted to the Permanent Commission, while Mr. Pretorian proposes to fuse the two projects, that of the Special Reporter and his own.

I agree with Mr. Pretorian, and I think that the committee suggested by Mr. Soulez might draw up this single question to be approved by the Permanent Commission. This question should be as detailed as possible so as to prevent any misunderstandings on the part of the reporters chosen. Therefore I associate myself with what Messrs. Soulez and Pretorian have just said.

Mr. Pretorian (in French). — I would like to complete Mr. Bloch's explanations. The manner of proceeding is, shortly, as follows : when a question has not been included in the agenda by the Congress, it must be inscribed by the Permanent Commission.

Sir Josiah Stamp. — It may very well be, as has been said that the final wording rest with the Permanent Commission but at the same time this body will undoubtedly be influenced by the summary from this meeting. I am willing to adopt Mr. Pretorian's rendering in place of suggested paragraph No. 4 but instead of « *participation in the profits* », it should read « *interest in results* ».

1. There is no clear indication where profits begin.

2. Words from the French do not cover the words « stock holding » satisfactorily.

3. Results departmentally cannot necessarily be defined as profits.

There are half a dozen other reasons of the difference between « profit sharing » and « interest in results ».

With these reservations I am quite willing to see M. Pretorian's suggestions adopted instead of the original one in paragraph 3.

Mr. Marin del Campo (in French). — As I said a little while ago, the President and I were induced to compose the proposed formulæ by two considerations : to satisfy every way of interpreting Question XV, and then, while giving complete satisfaction to each of the points of view, to take care not to wrong any others. This formula is rejected by Messrs. Soulez and Bloch. They alter it so that absolutely nothing of it is left !

As regards this misunderstanding, I should like to recall certain points of the report I drew up in collaboration with Mr. Canovas del Castillo, which will clearly show our way of looking at the matter.

— The Speaker then read part VI of the report in question entitled : « Our de-

tailed questionnaire and replies received.» He then continued as follows :

May I be allowed to insist that we scrupulously conformed to all the indications of the Permanent Commission, and we addressed ourselves to Messrs. Soulez and Bloch; they had already sent their questionnaire round to the different administrations, so, for the sake of conciliation, we made the first part of ours practically identical with Messrs. Soulez and Bloch's whole questionnaire, and they likewise promised to incorporate our ideas in their report. But they did not do so. And now they say that we did not rightly understand the matter nor correctly interprete the views of the Permanent Commission !

I mention these facts with regret, desirous, as I always have been of arranging the matter in a friendly way.

It was to this purpose I drew up the proposed formula, and I continue to maintain the same point of view that I have defended up to the present.

Mr. Bloch (in French). — I am desolated to see the Special Reporter once more taking up the arguments *ad hominem* which he developed at yesterday's meeting. I wonder what prompts him to do so ! When the meeting reopened I thought we were more or less in agreement. Mr. Soulez and myself proposed a few slight modifications to the text prepared by Mr. Marin del Campo, and Mr. Soulez's recent proposal was intended to unify all our points of view and bring about that harmony which seems to be needed in this meeting. He proposed to form a little committee which, during a short adjournment of the meeting, perhaps half-an-hour, might draw up the agenda to be submitted to the Permanent Commission.

The Special Reporter on his side has pointed out two possible questions. Now it seems difficult to submit two questions to the Permanent Commission which probably could only retain one of them. Under these conditions we thought it better to combine them, as Mr. Pretorian proposed, so as to make a whole of them and group them under a single heading to be determined by the committee in question, so as to meet everybody's views. Really we are somewhat surprised that the Special Reporter is not yet satisfied.

Mr. Soulez and myself again put forward this proposal to form a small committee to draw up the programme to be submitted to the Permanent Commission. The Special Reporter might be on this committee, as well as Mr. Pretorian and whatever members you would like to take part in the discussion.

Mr. Djouritchitch (in French). — As the Special Reporter's proposal was made before that of Messrs. Soulez and Bloch there is no inconvenience in trying to make them agree. It is even quite in accordance with our usual custom, and therefore I second the proposals made to reconcile the different points of view.

Mr. Marin del Campo (in French). — Courtesy requires that I should answer Mr. Bloch.

We spent the whole morning both yesterday and to-day trying to come to some agreement. I drew up my proposal in accordance with the views and wishes of the President. As it has been rejected I have nothing further to say.

The President (in French). — I should like to point out to Mr. Marin del Campo that this proposal has not yet been rejected as the Section has not yet come to any conclusion.

Mr. Pretorian (in French). — Gentlemen, there is no end to the matter if we go on like this, and nevertheless we must come to some conclusion.

Calling to mind the very reasonable statement made by Mr. Djouritchitch yesterday, I think it only fitting to take up his proposal and formulate a resolution as follows :

« The 4th Section of the Congress finds that the information received from the different railway administrations was not conclusive, despite the efforts of the reporters to elucidate the question. In its opinion the question should be referred for further study at the next Congress under the form given below; and it hopes that at the next Session it will be possible to evolve summaries and make profitable recommendations, the reports presented at this Session being taken into account. »

Mr. Martin, Paris-Orleans Railway (in French). — Gentlemen, it seems to me, after all, that Mr. Bloch's proposal is deserving of careful attention. In short, it is a question of either evolving the summaries, or of putting the question off for three years.

Since such an important decision has to be made, I am of the same opinion as Messrs. Soulez and Bloch as regards the setting up of a small committee charged with drawing up a precise text.

Mr. Bloch asks for half-an-hour's adjournment of the meeting. As the question of the participation of the staff in the profits is one that has been debated for over a hundred years, I think it would be ungracious to deny him this small concession.

Mr. Pretorian. — I second this opinion.

— The setting up of a committee to draw up the new text is at once taken in hand.

This committee is composed of the Special Reporter, Messrs. Soulez and Bloch, Canovas del Castillo (Reporters), Djouritchitch and Sir Josiah Stamp, the president being Mr. Pretorian.

— The meeting is adjourned from midday until 1 o/c.

The President. — Mr. Pretorian will begin by reading the text agreed upon by the committee.

Mr. Pretorian (in French). — The committee unanimously decided upon the following text :

The Fourth Section considers that, in spite of the efforts made by the Reporters, the information received from different Administrations on the subject of Question XV is not conclusive. The Section is of the opinion that the matter should be referred back for further investigation and inclusion on the agenda for the next Congress, in the following terms, and expresses the hope that the next Congress, by taking into account the data already received and the further information which will be collected, will be in a position to make suitable recommendations :

Participation of the staff in the results of working, under the various aspects of the problem of remuneration during each year, with the view of enlisting the men's close and harmonious co-operation in obtaining the maximum output and furthering the prosperity of the undertaking, at the same time giving railway users the best possible transportation at minimum cost. Methods of any kind will be considered and particularly those hereafter :

1. Methods of interesting the staff in the partial or complete results of railway working.

2. Co-operation of the staff in the working of the undertaking (setting up sectional councils and suggestion schemes, etc.).

3. Methods of binding the staff to the railway service (social work, pensions, housing schemes, medical benefits, insurance, etc.).

4. Technical instruction.

Mr. Navarro, State Railways of the Portuguese Colonies (in French). — I quite agree with the text proposed by the committee we set up, but from the point of view of correct procedure, as it is the prerogative of the Permanent Commission to fix the questions — it has moreover already given out the questions to be studied at the next Congress — I think the texts should begin as a suggestion, so that the Permanent Commission may modify the recommendations of the Section, elaborated at this meeting.

If the Permanent Commission rejects the recommendation to refer the matter to the next Session of the Congress, we will have nothing left to vote on. Therefore it is a proposal that should be made to the Permanent Commission who has the power to approve or disapprove.

We formed the resolution to suggest to the Permanent Commission that the matter should be referred to the next Session of the Congress. I find that from the point of view of form, this would be more regular.

Mr. Marin del Campo (in French). — Is not the Assembly supreme ?

Mr. Navarro (in French). — Yes, but the statutes do not allow us to vote any contrary thing.

Mr. Bloch (in French). — A slight modification might be made by wording the second sentence : « It is of the opinion that the Permanent Commission should be asked to refer the matter back for further study... »

Mr. Pretorian (in French). — I agree that the idea of suggesting should be inserted, and I think the following wording ought to satisfy everyone.

« The Section suggests to the Permanent Commission that the matter be referred back for further investigation and inclusion on the agenda for the next Congress... »

Mr. Navarro. — Exactly.

The President. — Are there any further remarks ?

No one else wishing to say anything, the new text, slightly modified as Mr. Pretorian proposed, is considered as adopted and will be submitted for approval to the General Meeting.

The Meeting ended at 1.15.

DISCUSSION AT THE GENERAL MEETING.

Meeting on 10 May 1930 (morning).

PRESIDENT : MR. JOSÉ GAYTAN DE AYALA.
GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.
ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary.* — We must now examine the summaries of Question XV, which you have had the opportunity to read in the *Daily Journal of the Session.*

Are there any remarks ?

Mr. Marin del Campo, *Special Reporter.* — In the enunciation of the resolution submitted to us it is said in the French text : « Participation du personnel aux résultats de l'exploitation, les différents aspects que présente le problème du *traitement* du personnel... »

In French we clearly understand the expression « *Traitement du personnel* » to mean the way in which the staff is treated from every point of view.

The German expression « Behandlung des Personals » is well chosen, while the expression used in the English text « staff remuneration » signifies in fact « *retribution du personnel* » so that it has not the general meaning of the French and German texts.

On the other hand are the English expression « co-operation » and the German expression « Mitarbeit » the exact equivalents of the French word « coopération » ?

I should like to be certain about these points.

Sir Josiah Stamp, London Midland & Scottish Railway. — I am in agreement with the changing of the English text, and with the replacement of the word « remuneration » by the word « treatment », which corresponds more closely to the French word « traitement ». On the other hand, I think that the term « co-operation » is the equivalent of « coopération » in French, and that it need not be altered.

Mr. Wolff, *Assistant General Secretary.* — The Secretariat is examining the possibility of changing the German expression so as to make it absolutely clear that it is to be interpreted in the sense of co-operation.

Mr. Ghilain. — Are there any further observations ?

— (No one else wished to speak).

As there are no remarks, it is understood that the summaries will be those appearing in the French edition of the *Daily Journal*, the expression « Traitement du personnel » being taken in the broad sense of the word. The corresponding German word will be retained since it has the required meaning, but in the case of the English text, the word

« remuneration » will be replaced by the word « treatment ». *(Approved.)*

The President. — These therefore are the summaries :

SUMMARIES.

« The Fourth Section considers that, in « spite of the efforts made by the Repor- « ters, the information received from dif- « ferent Administrations on the subject « of Question XV is not conclusive.

« In these circumstances the Section « suggests to the Permanent Commission « that the matter be referred back for « further investigation and inclusion on « the agenda for the next Congress, in the « following terms, and expresses the hope « that the next Congress, by taking into « account the data already received and « the further information which will be « collected, will be in a position to make « suitable recommendations :

« Participation of the staff in the re- « sults of working, under the various « aspects of the problem of treatment « during each year, with the view of « enlisting the men's close and harmo- « nious co-operation in obtaining the « maximum output and furthering the « prosperity of the undertaking, at the « same time giving railway users the best « possible transportation at minimum « cost. Methods of any kind will be con- « sidered and particularly those hereaf- « ter :

« 1. Methods of interesting the staff in « the partial or complete results of rail- « way working.

« 2. Co-operation of the staff in the « working of the undertaking (setting up « sectional councils and suggestion sche- « mes, etc.).

« 3. Methods of binding the staff to « the railway service (social work, pen- « sions, housing schemes, medical bene- « fits, insurance, etc.).

« 4. Technical instruction. »

QUESTION XVI.

METHODS FOLLOWED IN TRAINING OF STAFF, PROFESSIONAL, TECHNICAL AND ORDINARY WORKING GRADES.

Preliminary documents.

1st Report (all countries, except those hereafter), by Mr. MEREUTZA. (See *Bulletin*, August 1929, p. 1433 or separate issue No. 17.)

2nd Report (Belgium, France, Holland, Italy, Portugal, Spain and their Colonies), by Mr. BARTH. (See *Bulletin*, September 1929, p. 1905 or separate issue No. 26.)

3rd Report (America, the British Empire, China and Japan), by Mr. L. C. FRITCH. (See *Bulletin*, August 1929, p. 1315 or separate issue No. 16.)

4th Report (Germany), by Dr.-Ing. B. SCHWARZE. (See *Bulletin*, April 1930, p. 1197 or separate issue No. 73.)

Special Reporter : Mr. BARTH. (See *Bulletin*, May 1930, p. 1526.)

DISCUSSION BY THE SECTION.

Meeting held on the 12 May 1930 (morning).

PRESIDENT : MR. MORENO, CONDE DE FONTAO.

The Meeting opens at 9.30 a. m.

The President (in French). — To-day we have to discuss Question XVI. Mr. Barth, the Special Reporter, will speak.

Mr. Barth, *Special Reporter* (in French). — Mr. President, Gentlemen, as several of the reporters have remarked, the subject dealt with as Question XVI of the present Congress is of great importance; in fact, 60 to 70 % of the total expenses of a railway are staff expenses, so that even a small decrease in this percentage results in considerable economies.

Now, such expenses may be attributed to two factors : on the one hand the wages paid, and on the other the number of men employed.

It is not possible, it would seem, to consider any reduction in wages. On the contrary, experience proves that wages are always increasing, and furthermore is it not, generally speaking, the duty of employers to increase the material and moral welfare of their employees, while continuing to assure to their clients the maximum number of advantages, *i. e.* the provision of a comfortable and regular service at a reasonable price ?

Therefore if economies must be made, it is the second factor that is of import-

ance. There are several possibilities : the development of mechanical methods on the one hand and, on the other, an increase in the output of the staff. This latter can be obtained by improved methods of working, as well as by instructing the staff in such methods and encouraging employees, by appropriate means, to increase their output.

This last point was dealt with by Messrs. Soulez and Bloch in their report on Question XV, and personnaly I regret that it was not discussed.

As for the two other questions — improved working conditions and the instruction of the staff — there is a very close connection between them, as it seems only reasonable to decide which are the best methods before any are taught. For this reason, two of the reporters, Mr. Mereutza and myself, asked the railways to whom we sent the questionnaires to supply us with information about any measures taken by them to discover the most economical and rapid ways of carrying out the work necessitated by the railway industry. As a result we discovered that, as far as the workshops were concerned, important results have already been obtained, but in the railway field properly so called very little has been done as yet. However we will not give too much prominence to this question which really forms part of the subject of the organisation of labour, which we believe will be on the programme of the next Congress.

We will therefore now consider the question of instructing the staff.

In his report, Mr. Schwarze shows that very valuable results can be obtained at little cost by developing such instruction. In fact he has calculated that on the Reichsbahn where such instruction has been very highly organised, the expenses involved represent no more than 0.015 % of the total expenses.

The question of instructing the staff can be divided into three parts : first, the selection of candidates; secondly, training given before employment; and thirdly, instruction given to the actual staff.

The selection of candidates is a very important matter. In fact it is absolutely necessary for the railways to make sure that candidates have the qualities needed to carry out the duties that will ultimately fall to their lot. The most usual way of making this selection is to make candidates pass an examination. Examinations or tests are made on general knowledge, but may also include the special knowledge needed for certain posts. Such examinations differ a great deal according to the nature of the employment desired by the candidate. We will not enter into any details now. When it is a question of the higher posts, diplomas are required from the candidates.

Furthermore, for some years already, certain railway companies have introducted psycho-technical tests with the object of finding out, in the realm of the subconscious, the special qualities required for certain kinds of employment. For example, such tests make it possible to determine the rapidity with which a candidate will react to excitation of his nervous system (excitation by sight and hearing, power to arrest quickly some action already begun); others make it possible to judge of his ability to estimate speeds and distances, his emotivity, etc. Tests of this sort are resorted to, for example, by the « Société des Transports en commun de la Région parisienne », which has paid much attention to this question and obtained very good results : for example, since these psycho-technical selective tests have been held, the propor-

tion of driver candidates who have had to be dismissed during their period of apprenticeship has fallen from 18 to 4 %. The Czechoslovakian State Railways hold similar tests and are satisfied with the results.

We think that the extension of such tests is to be recommended.

Such, briefly, are the measures taken by the different railways to select candidates. However many railways are not content merely to make a careful selection of candidates, but prefer to control the instruction the candidate receives before entering into their service. Such instruction is very necessary, moreover, in countries where the general educational standard is not high enough to make it possible for the railways to obtain candidates sufficiently instructed to carry out even the duties with which beginners are entrusted.

Certain railway systems subsidise private institutions where training corresponding to their own needs is given. However, it must be remarked that the companies doing this seem to be on the point of giving it up. Other companies found scholarships, especially for the children of their employees.

The greater number, however, train their candidates themselves, either by means of individual probation periods, or else by courses of training.

The individual probation system is used for all categories of staff, but is above all intended for those candidates who wish to attain to managerial posts. There is a very definite tendency on the part of most railway companies to instruct candidates for the higher posts in the details of such work as they will afterwards have to supervise. Such candidates must, for example, pass a period in the workshops so that they may become acquainted with the various tools; a period on engines till they have learnt how a locomotive is driven; a period in the stores till they are familiar with the nomenclature of the different stocks; and lastly a period in the offices where they themselves do the usual work of the employees.

In general this practical training is combined with theoretical instruction, given either away from the railway in institutions by agreement with the railway, or on the railway itself in schools which serve the twofold purpose of giving instruction to candidates and to employees. We will speak about this second case later on.

Incidentally we notice that certain railways give the preference to those candidates who succeed in obtaining a diploma during the course of apprenticeship.

The various periods usually end by an examination which shows if the candidate has sufficiently profited by the instruction given.

We will now briefly speak about the courses of training, still confining ourselves to those that precede the actual employment of candidates.

First of all a distinction must be made between those organised for candidates for manual work, and those for other candidates.

Those intended for the former category are a real form of apprenticeship destined to train efficient workmen : fitters, boiler-makers, smiths, joiners, etc. However certain companies also admit other categories of employees to apprenticeship, in particular, engine drivers, junior traffic department staff and permanent way maintenance staff.

Training is very highly developed on the railways; a great many companies make use of it and some of them state

that they train several hundred apprentices every year.

In many cases the apprentices are indentured, the father or guardian of the apprentice undertaking, in consideration of the remuneration which the latter receives, to agree to his engagement on the permanent staff of the railway at the end of his apprenticeship.

In general the railway, on its side, assures the apprentice employment if he has given satisfaction.

The length of time the training takes varies widely. Generally it lasts several years.

In the first place the apprenticeship consists of instruction in a manual trade, but many railways also give their apprentices theoretical and even general instruction. Furthermore, certain companies, in order to make sure that they will have competent foremen, make a selection at either the beginning or end of the apprenticeship, of the most promising candidates and give these a more detailed theoretical and general instruction which will qualify them for the higher posts.

As regards candidates for other posts, certain companies have started special schools for these, where, before they enter upon their duties, they receive a good general education as well as instruction in the duties they will eventually have to carry out. Courses of this kind have been instituted, in particular, to train traffic deparment clercks, train staff, and engine drivers. Such courses are usually similar to those intended for the existing staff and are generally given in the same place.

Finally we must consider the instruction of the staff on duty. As we said at the beginning of our report, this instruction is extremely important from the point of view of the output obtained; obviously it is very advantageous to teach the staff how to do its work well, economically and rapidly. It is also extremely important from the point of view of the prevention of accidents. The railway is in fact a very dangerous industry and unfortunately accidents are frequent in spite of all the precautions taken. It is therefore extremely necessary to teach the staff the regulations that must be observed in order to secure them from the accidents with which they are ever being threatened.

In former times the staff was left to pick up what instruction it could. Employees had simply to profit by the advice given them by their companions or superiors. However the railway systems saw that this method did not suffice and had therefore to be improved upon.

Certain companies contented themselves with offering their staff every facility for following general instuction courses outside the railway, either at universities or private schools. This method has been fairly well developed by the English railways in particular.

The latter also practise another method which consists in granting subsidies to societies whose object is to organise conferences at which the employees discuss among themselves questions relating to railway matters. Such conferences enable indeed different points of view to be compared, often with valuable results.

Certain companies also encourage mutual improvement courses by giving the staff the means to realise these (furnishing, lighting and heating of suitable assembly rooms), and placing at their disposal any litterature or models needed for their instruction.

It must also be remarked that certain companies have organised libraries and

reading rooms to which the staff have free access outside working hours.

Others have started magazines which are distributed free to the staff and contain articles of general interest or on matters more particularly concerning the railway in question.

Some others have instituted bodies of inspectors who travel about the railway and make sure that the working methods are well taught and that the staff work under good conditions and know the regulations properly.

Finally, others have organised evening classes so that the staff can devote part of their free time to completing their general and theoretical instruction.

However, the most general method is the organisation by the railway of schools where the employees come together and receive direct instruction concerning their duties, during ordinary working hours.

However, as Mr. Schwarze remarks, it is very important to place judicious limits to the instruction given. Great care must indeed be taken that the instruction given is not encumbered with facts that will be of no profit to the staff in question.

The material conditions under which instruction is given should also be carefully studied. In some cases it is better to instruct the employees on the spot, while in others it is better to collect them in centres where they can be taught in groups.

Lectures given on the spot are given either in appropriate places or in special wagon schools that have all the necessary equipment : models of stations with their signals, models of the track, locomotives, brakes, etc.

As regards the special schools founded by certain railway companies to give instruction to members of the staff collected from all over the railway, the reporters received very complete and interesting descriptions of such schools.

We must make special mention of the High Traffic School of the Paris-Lyons & Mediterranean Railway, at Dijon, the Advanced School of the French State Railways at Rouen, the Schools of the German State Railway Company, the Danish State Railways, the Sydney Railway & Tramway Institute, and the Schools of the Indian State Railways.

The instruction given either in these special schools or on the spot is intended for very various categories of staff, if all the different companies are taken into account. This leads us to think that the practice of giving such instruction could give very valuable results in all departments. We will mention in particular the traffic department staff, staff charged with the settlement of claims, train staff, shunters, drivers and firemen.

The instruction of the traffic department staff deals with telegraphy, signalling, traffic regulations, as well as the best methods of securing loads, trimming loads, weighing and verifying the loading gauge, etc. Such instruction is often given in special wagons schools where the instructors have at their disposal the small scale models they need. The cinematograph is also frequently used, apparently with good results.

The instruction given to shunters includes the best methods of making up trains, of verifying and rectifying loads. A very important part of this instruction deals with safety methods and the measures to be taken to avoid accidents. Here also the cinematograph is of great use in illustrating what should or should not be done.

The instruction given to employees who have to deal with the settlement of claims

includes tariff questions and the fundamental principles of commercial law.

Instruction for drivers and firemen deals with the upkeep of the engine and its accessory parts, the reparation of possible damage, the probable causes of serious accidents, and the measures to be taken to prevent these.

Examples could be multiplied.

In conclusion we will simply remark that the instruction given by the railway administrations, while leading to a general improvement in output, also facilitates the promotion of the pick of the staff. This is a factor of a social order which must not lightly be passed over.

We hope, Gentlemen, that this brief summary will enable you to understand that the railways have taken very extensive measures to ensure the instruction of their staff.

In conclusion we will read you the text which, in agreement with Messrs. Mereutza and Schwarze, — Mr. Fritch unfortunately is absent —, we propose for your adoption. The text is as follows :

The information furnished in reply to the questionnaire indicates that staff instruction is well organised on the majority or the railways.

1. Railway Administrations should take particular care to select candidates possessing the necessary qualifications for the posts to be filled. To this end, candidates should be required to pass an examination in general knowledge, or furnish a school certificate. Special examinations, including psycho-technical tests, should however, be instituted if necessary. Several Administrations have made use of such tests with very satisfactory results; their extension is recommended.

2. Preliminary instruction should be given before the appointees commence work. This instruction will, of course, vary in character and duration, for ordinary workmen, artisans and clerks. With this end in view, most of the Administrations have created institutions of a more or less perfected kind, particularly as regards apprenticeships. It is recommended that Administrations should take care to give their manual workers at least as good a training as that afforded by other industries in their respective countries.

3. In view of the information furnished by the various Administrations and the trials already carried out, it is recommended that employees should be given regular and methodical instruction in regard to new regulations, new developments in their respective spheres of work, and be taught to carry out their work economically (*i. e.*, obviating waste of time or materials) punctually, and with safety to themselves, the public, and the rolling stock, etc. The employees should be required to serve probationary periods, either in technical schools, or by instruction at the stations, depots, etc., using travelling schools (wagons-écoles), magic lanterns, and the cinematograph. Good results have been obtained from instructional cinematographs, and their use is recommended.

It is strongly recommended that men who work alone should receive careful instruction, and further that practical training should be given as regards the steps to be taken in the event of accidents or other emergencies.

Furthermore, it is necessary to test the men from time to time to see that they have assimilated the knowledge imparted to them.

4. It is also recommended that support should be given, as far as possible, to private institutions which provide tuition for the men, and attention is drawn to the method of teaching by correspondence, which has been successfully adopted by some Administrations.

5. Finally, men of particular merit should have an opportunity of being tested in regard to their powers of judgment and ability to command, with a view to promotion to the higher grades.

The President (in French). — I thank Mr. Barth for his excellent report. We will now discuss the matter. Mr. Poirel will speak first.

Mr. Poirel, Ministry of Public Works, France (in French). — Mr. President, Gentlemen, I ask the Assembly to consider the following recommendations :

« The 4th Section notes the information supplied in the report of Mr. Barth, Chief Engineer of the French State Railways, on the methods adopted for the training of staff of all categories.

« It recommends the Permanent Commission to endeavour to obtain from the railway companies further information concerning this question.

« As far as apprentices are concerned, the Section recommends that in countries where military service is obligatory, apprentices whose conduct and work has been satisfactory should be assured of obtaining suitable employment on their respective railways when they have finished their military service.

Mr. Barth (in French). — I have no objection to make to Mr. Poirel's recommendations, provided that two reservations are made : first of all, that the apprentices in question have given entire satisfaction; and secondly, that the railways where they were trained have any suitable vacancies. These recommendations must not be misinterpreted as meaning that apprentices will be given employment in every case, even if there are no vacancies on the railway.

Mr. Mereutza, *Reporter* (in French). — Mr. President, Gentlemen, I think everyone is agreed as to the congratulations that Mr. Barth deserves for the great care he has expended on his special report. However there is one part of it that should be given particular prominence : after the personnel has received special training, the control of such training must be all the more vigilant as the importance of the work increases; care must be taken that the employee has really assimilated what he has been taught; steps must be taken to ensure that the staff is always well disciplined and that it carries out its duties according to the regulations, *i. e.* an absolutely rigorous discipline as the Special Reporter has just remarked in his report.

As far as the point raised by Mr. Poirel is concerned, it must be said that all the railway companies make a contract with their apprentices, but this contract binds the apprentice himself. I do not know of any railway company binding itself to give the apprentice employment when he has finished his training. In the normal course of events he will be employed if there are any vacancies on the railway in question. In Rumania, for example, where military service is obligatory, when the apprentice has finished his military service he is readmitted to the railways as though he had just finished his training if he gave satisfaction before and if there are any vacancies.

I do not know if it is necessary to raise this point in the summaries, concerning the wording of which I am in entire agreement with the Special Reporter.

Mr. Poirel (in French). — Gentlemen, please allow me to insist on the adoption of the last part of my recommendations.

When a young man of 13 or 14 has

been taken on and given a special training on the railway it seems to me that the railway has a moral obligation to employ him when his military service is finished. Otherwise such a young man with his specialised knowledge will find it difficult to get a job in any other industry.

I have known cases of apprentices who had spent six or seven years training on certain railways. The railways certainly did them a service in giving them a thorough professional training, but these same men eventually found themselves without a job. Such mechanical industries as motor manufacturers, etc., could not employ them for the very good reason that they were specialists in the railway industry.

Therefore I wish to insist on the last part of my recommendations being adopted.

Mr. Cramp, Ministry of Transport, Great Britain. — I wish to emphasise the necessity of training the staff upon entry into the railway service under *actual practical conditions*. In Great Britain there are many rules and regulations and a number of supplementary notices are issued, and a young man's instructions are usually confined to what he can obtain from such printed notices, which places him under a disadvantage if anything irregular happens under practical conditions, as accidents, etc., do not present themselves in quite the same way as they are represented in the book.

It is true that supervisory staff give instructions to men in their charge, but so far as the operation of trains and working of signal boxes are concerned, the staff are not prepared for contingencies if not trained under practical conditions.

I therefore suggest that careful attention be given to the question of training the staff under practical conditions, in order that they should be competent to deal with emergencies, which is especially necessary in the case of men who work alone.

Mr. Barth (in French). — In answer to Mr. Poirel, I will simply point out that the railway companies in training apprentices are certainly working in their own interests since by so doing they assure themselves of employees with the requisite knowledge, but at the same time they are also working in the interest of the apprentices, since they teach these, at great expense, a trade which, generally speaking, such apprentices will find useful in the case of industries other than the railway.

As said before, I have no objection to make to the principle of the recommendations in question, provided that the two conditions with which every one seems to agree, are not lost sight of. After all, it is a question of priority, the available jobs being given to the former apprentices.

The President. — Do you agree, Mr. Poirel ?

Mr. Poirel (in French). — The idea of « it not being obligatory » does not please me. I know that it is difficult to find a formula to fit the compromise, so let us say « priority » though I should have preferred to say « obligation ».

Mr. Barth. — Agreed. As far as Mr. Cramp's statement is concerned, I think we all agree with him. No doubt he wishes his remarks to be included as an additional summary.

Mr. Schwarze, *Vice-President and Reporter* (in German). — Gentlemen, may

I be allowed to comment on certain points in the Special Reporter's very comprehensive and interesting report, and also to ask for further information.

No doubt we all noted and were very interested in that part of the report where the question of the excellent results obtained by experiments made in collaboration with certain psycho-technical laboratories was raised. The experiments made correspond more or less with similar experiments made by the Reichsbahn on a large scale. Already about 120 000 ability tests, followed by counter-tests and verifications carried out with great care, have been made, so that it is possible to affirm that a prudent use of such tests gives good results.

I am therefore in agreement with the Special Reporter on this matter. Certain points remain to be cleared up, and I wish to receive further information about these. It was stated that on the French Nord Railway employees pass a period of three months at the training centre. I should like to know upon what principles the replacing staff is indemnified, and if those concerned pay them this indemnity themselves, since, with a numerous staff, very considerable expense must result. On the other hand, I should like to know who pays for the instructors; whether the latter are railway officials, and if so, whether they receive any special allowance in addition to their ordinary salary. The Reichsbahn found that it was better to give such officials an additional wage when it was a question of giving instruction on difficult subjects, since they often had to devote some of their free time to preparing the necessary lectures or courses. On the other hand nothing extra is paid for lectures or courses on simple subjets. This question is of great financial importance for a large railway company.

The Special Reporter also mentioned wagon schools. Further information about these would be interesting. As far as I know nothing has been published on this subject up to the present in technical publications, nor in the English or North-American reviews. As far as German schools of this sort are concerned, a great deal has been published, including a whole series of drawings. In the interest of mutual improvement, it would be useful to exchange information on this subject.

Furthermore, the Special Reporter has frequently made use of the expression « training centres ». It would be useful to learn how such centres are organised. We have found it extremely difficult to organise rational instruction for the staff. In effect, it is necessary to make sure that every individual benefits by the instruction given. The difficulty is particularly great when, for example, it is a question of instructing drivers or train staff; it very easily happens that only a small proportion of such staff receives the instruction, the rest being out on duty. Some ingenious arrangement must be made to ensure that every single one of such employees really benefits by such instruction, since experience goes to prove that accidents can be precisely ascribed to those employees who missed the instruction given. In Germany, we have evolved a working system which gives the desired results; I have brought certain specimens of it with me and those interested can examine them. The Special Reporter has given us the conditions of apprenticeship indentures on the French Parys-Lyons & Mediterranean Railway. Here is a similar German indenture. In all essentials they more or less correspond.

Further, the Paris-Orleans Company state that both oral and written instruction is given on their railway. We knew that correspondence courses have been used for a long time in the United States, but it was only from the reports that we discovered they were also used in Europe. The results are said to be good, though in practice it is very difficult to follow such results and ascertain if such instruction reaches the necessary standard.

Also, an extremely interesting remark was made about the organisation of examinations for workmen on the great French Railways. I must say, I was agreeably surprised to learn with what care workmen and artisans were examined before being employed. I think that such examinations, or the organisation of such examinations, depend very much on the economic conditions prevalent in the country. When there is a shortage of labour and industrial activity is great, it is not possible to be as particular as at other times. We have had a certain number of instructional books and accessories brought there. Unfortunately it will be a day or two before they will be at the disposal of those interested in the matter. Those delegates who wish for further information are requested to get into touch with any of the representatives of the Reichsbahn.

Mr. Landra, Italian State Railways (in French). — The matters discussed by the different speakers up to the present are certainly very interesting, especially from the point of view of information of a professional kind. But I am afraid that if we embark upon too many details, it will be difficult, if not impossible, to come to any agreement.

One speaker has just said that in the matter of professional instruction it is better to be guided by practice; others seem to give the preference to theoretical instruction.

In my opinion, it would be better to leave each country free to apply the method most in agreement with its traditions and special conditions.

For example, I have read in the reports, among the information supplied by the new countries, that some of these have adopted the Napoleonic theory that every soldier can become a marshall ! Certainly there would be difficulties in adopting such a system in Western Europe.

For this reason, Gentlemen, I repeat that I consider it preferable not to go into too many details, so as to be able to come to some agreement. The general summaries that the reporters have agreed upon are excellent and I propose their adoption without any modifications.

On the other hand, I have nothing whatever against Mr. Poirel's recommendations, which I intend to re-examine more closely.

Mr. Hondl, Czechoslovakian State Railways (in French). — The Special Reporter has put forward a recommendation of psycho-technical tests, and I should like to give this assembly certain details of the results obtained in this connection by the Czechoslovakian State Railways.

Since 1923, our Administration has made the psycho-technical test an obligatory part of the selection of candidates fort the traffic department — administrative and executive staff — *i. e.* for candidates who have finished their studies at the secondary schools and are admitted as pupils in the professional railway schools in each of the different areas of the State Railways. This test is a written examination, corresponding in extent with the model of an examination elabo-

rated on the basis of experience acquired up to date, especially in America, Germany and Poland. It is carried out according to the Yerkes and Clerk system, account being taken of aptitude from a commercial point of view as well (commercial science, etc.). The actual experience and the statistics obtained by the State Railways prove that these psychotechnical tests offer incontestable advantages. They facilitate a choice being made of those candidates who have the qualities required by the special exigencies of the railway service, the duties of which are very varied and carry with them a great responsibility. These tests are held every year before pupils' names are entered for the professional railway schools in each area. A railway official is charged with making these tests. Afterwards the results are estimated and classified in agreement with the Psychotechnical Institute.

We have also compared the psychotechnical tests previously made on employees with those made on candidates on entering the schools. We found that in nearly 75 % of these cases, such a comparison proved the importance of the psycho-technical tests, because they correspond with the result obtained at school. We have also found that the results of these tests make it possible to choose the best employees and workmen of the different categories for the various branches of the railway service. Such is the present state of affairs in Czechoslovakia as regards this question.

On the other hand, I had a talk with the President about this particular matter. I wished to submit for discussion a question worded as follows :

« Theoretical and practical utility of modern psycho-technical methods as far as the different categories of railway staff are concerned, together with experience obtained up to the present from this point of view by the different railway administration. »

As the President pointed out to me that it was impossible to include this question in the present discussion, perhaps it would be possible to include it in the programme of the next Session, under the heading proposed for Question I : « Cases of application of the scientific organisation of work in a railway department. »

I leave the decision to the Section.

The President (in French). — It seems to me that Mr. Hondl's observations are implicitly contained in the summaries Mr. Barth has just read us.

Mr. Honold, Deutsche Reichsbahn Gesellschaft (in German). — One of the speakers remarked that theoretical instruction in schools could not replace practical training. It would perhaps be more exact to say that practical training must be completed by theoretical instruction. The old methods were unsatisfactory in that they put the new employee side by side with the old and expected the former to learn his duties by observing the latter at work. In this way he also picked up all the latter's mistakes. He simply learnt how this particular employee carried out his duties, but he did not learn how such duties should be carried out in accordance with the rules and regulations issued. It is precisely in the case of accidents that it has been proved that those employees who had merely had a practical initiation into their duties by observing an older employee at work, failed when it came to the point and made mistakes if the motives which led to the various regulations had not been carefully explained to them.

In consequence, neither practical training nor theoretical instruction alone suffice, but a combination of the two is required.

The special report mentions several times the organisation of a certain number of hours per month of instruction for the staff. Now, we know that it is impossible to collect all the staff together to attend a single course; many of them are prevented from attending by their duties, holidays, illness, etc. It is therefore not enough to say that so many hours instruction must be given every month, but it is necessary to enjoin that each employee must receive a definite number of hours of instruction during a definite period, a month, or a year. For this reason the Reichsbahn decreed that each employee must receive a certain number of hours of instruction every year, and it must be ascertained if he really has had this amount of instruction; it no longer suffices merely to have a certain number of hours set down in writing. This control has frequently proved its utility and practibility in the prevention of accidents.

Mr. Biscoe, North Western Railway, India. — I entirely agree with the remarks made by the last speaker, particularly as regards the question of training the staff after they have been taken on. The difficulty in India is enhanced by the question of languages, as all rules and regulations have to be translated by mouth to illiterate staff, who form the majority of the personnel. This means that they have to rely on the teaching of their superiors, which results in wrong methods being perpetuated. We now have a system of giving lessons to subordinate staff and officials under which these men must pass through the schools, and it is hoped that by this means it will be possible to correct any mistakes inculcated by the original men concerned.

The younger members of the staff and applicants for promotion have to pass an examination upon completion of the courses, but in the case of older employees (men 40 years of age and over) I doubt whether an examination has any value whatsoever, as a man of that age finds it difficult to pass an examination, having been away from such things for so long.

I should like to know whether other countries experience a similar difficulty in this respect.

The President (in French). — If the Meeting agrees, Mr. Barth will now read us the summaries with the wording finally agreed upon.

Do you want the whole text to be read or merely the additions proposed ?

— The majority were of the opinion that it would suffice to read the modifications of the wording.

Mr. Barth (in French). — In order to take Mr. Cramp's observations into account we propose to add the following recommendation before the last paragraph of point 3 of the Summaries.

« It is strongly recommended that men who work alone should receive careful instruction, and further that practical training should be given as regards the steps to be taken in the event of accidents or other emergencies. »

On the other hand, we will take Mr. Poirel's recommendations into account by the following addition at the end of point 2.

« It is also recommended that all Railway Administrations in countries where military service is obligatory should give priority to their ex-apprentices who, on

the termination of their military service, submit applications for employment in any posts that may be vacant. »

— Approved.

The President. — The summaries are therefore approved together with the modifications made to the original text.

Mr. Barth (in French). — Mr. Pretorian proposes a further addition at the end of point 3. Our summaries state that : « Furthermore, it is necessary to test the men frequently to see that they have assimilated the knowledge imparted to them... » Mr. Pretorian proposes to add « and are making good use of it ».

— Approved.

The President (in French)). — Mr. Ghilain, the General Secretary, has just given me the list of the questions it is proposed to include in the programme of the XIIth Session at Cairo in 1933.

As far as the 4th Section is concerned there are only two questions :

« 1. Instances of the application in a railway department of the scientific organisation of work. »

« 2. Competition between or joint working of railways and airways, or railways and roadways. An investigation from the technical, commercial and contractual points of view. »

We must decide which of these two questions shall have the preference, so that if only one can be dealt with that which is considered the most important shall be studied.

Mr. Pretorian (in French). — It must not be forgotten that the study of Question XV has been put off till the next Congress; therefore it continues to form part of the programme.

The President. — Before we come to any decision there will be a short interval.

The Meeting reopened at 12.0 after half-an-hour's interval.

The President (in French). — We have to decide which of the two questions proposed for inclusion in the programme of the 4th Section of the 1933 Congress, that I read you before the interval, shall be given the preference.

Mr. Pretorian (in French). — I am still of the opinion that we must consider the classification the President requires from us as that of the *new* questions to be discussed at the next Congress. Besides these questions we voted for the study of Question XV being carried over to the next Congress. This recommendation was ratified by the General Meeting.

Under these conditions, Question XV logically remains the first on the programme of the next Congress.

— The majority of the Assembly were in favour of Question I :

« Instances of the application in a railway department of the scientific organisation of work. »

Mr. Pretorian (in French). — Finally we must thank the President for the courteous way in which he has led the 4th Section's discussions. *(Applause.)*

The meeting ended at 12.0.

DISCUSSION AT THE GENERAL MEETING.

Meeting on 14 May 1930 (morning).

PRESIDENT : MR. JOSÉ GAYTAN DE AYALA.
GENERAL SECRETARIES : MESSRS. P. GHILAIN AND A. KRAHE.
ASSISTANT GENERAL SECRETARIES : SIR HENRY FOWLER, K. B. E., MESSRS. P. WOLF AND J. M. GARCIA-LOMAS.

Mr. Ghilain, *General Secretary.* — We now come to the summaries to Question XVI, which have been published in the *Daily Journal of the Session.*

Are there any observations as regards the text ?

— No one wished to speak.

The President. — The final summaries are consequently as follows :

SUMMARIES.

« The information furnished in reply « to the questionnaires indicates that staff « instruction is well organised on the « majority of the Railways.

« 1. Railway Administrations should « take particular care to select candi- « dates possessing the necessary qualifi- « cations for the posts to be filled. To « this end, candidates should be requir- « ed to pass an examination in general « knowledge, or furnish a school certi- « ficate. Special examinations, includ- « ing psycho-technical tests, should how- « ever, be instituted if necessary. Se- « veral Administrations have made use « or such tests with very satisfactory re- « sults; their extension is recommended.

« 2. Preliminary instruction should « be given before the appointees com- « mence work. This instruction will, of « course, vary in character and duration, « for ordinary workmen, artisans and « clercks. With this end in view, most « of the Administrations have created in- « stitutions of a more or less perfected « kind, particularly as regards appren- « ticeships. It is recommended that Ad- « ministrations should take care to give « their manual workers at least as good « a training as that afforded by other in- « dustries in their respective countries.

« It is also recommended that all Rail- « way Administrations in countries « where military service is obligatory « should give priority to their ex-ap- « prentices who, on the termination of « their military service, submit applica- « tions for employment in any posts that « may be vacant.

« 3. In view of the information fur- « nished by the various Administrations « and the trials already carried out, it « is recommended that employees should « be given regular and methodical in- « struction in regard to new regulations, « new developments in their respective « spheres of work, and be taught to carry « out their work economically (*i. e.*, ob- « viating waste of time or materials) « punctually, and with safety to them- « selves, the public, and the rolling « stock, etc. The employees should be « required to serve probationary periods,

« either in technical schools, or by in-
« struction at the stations, depots, etc.,
« using travelling schools (wagons-
« écoles), magic lanterns, and the cine-
« matograph. Good results have been
« obtained from instructional cinemato-
« graphs, and their use is recommended.

« It is strongly recommended that men
« who work alone should receive careful
« instruction, and further that pract-
« ical training should be given as re-
« gards the steps to be taken in the event
« of accidents or other emergencies.

« Furthermore, it is necessary to test
« the men from time to time to see that
« they have assimilated the knowledge
« imparted to them, and are making
« good use of it.

« It is also recommended that support
« should be given, as far as possible,
« to private institutions which provide
« tuition for the men, and attention is
« drawn to the method of teaching by
« correspondence, which has been suc-
« cessfully adopted by some Administra-
« tions.

« 5. Finally, men of particular merit
« should have an opportunity of being
« tested in regard to their powers of
« judgment and ability to command,
« with a view to promotion to the higher
« grades. »

CURRENT PRACTICE.

[656 .254 (.44)]

Wireless intallation on trains of the French State Railways.

Figs. 1 to 5, pp. 571 to 573.

(*Génie Civil.*)

The considerable progress made by wireless during the last few years and the success of wireless reception in all mediums, has led railway companies and private undertakings of various countries to study the question of wireless installation on trains. The first possible use considered was the reception of telegrams addressed to travellers; this was successfully accomplished some years ago in America.

The next idea was to put installations at the disposal of passengers allowing them to pick up the programmes broadcast by different stations. Such installations can be used by a far greater number of passengers than the telegraphic installations. Even in the case of a short journey, passengers enjoy wireless as a means of passing away the time or of getting information.

The Canadian National Railways installed in 1922 wireless equipment in their trains for picking up concerts, and later on for the reception of telegrams. At present, telephone communication is possible between the train and fixed stations. Such communication is particularly justified in America owing to the length of journeys (about five days from Quebec to Vancouver, or from New York to San Francisco).

The first attempts were not at once completely successful. The problem is in fact very much harder than that of wireless installation in ships, where space is of less importance, and where the installation can be protected from those disturbing influences that occur on land. In the first installations on trains the disturbing effects of metal structures and the telegraph wires beside the line, upon the reception of wireless messages, as well as the effects of the lighting dynamos and vibrators, were not efficaciously overcome; in fact the presence of particularly numerous obstacles due to the presence of such a quantity of metal structures could not be avoided. The effect of fading-out during reception also was frequently observed.

The matter has just been taken up again by a new French Company, the « Radio-Fer » Company, whose president is Mr. Jacques Bompard, and manager, Mr. Robert Toussaint. After long researches, this firm has evolved a system which has been successfully put into service on the State Railways' lines from Paris to Havre.

In this system, atmospherics are almost completely eliminated, or so diminished as to be no longer a nuisance, so that good reception is possible of broadcasts not only from France but also from foreign stations. Therefore the power of the transmitting station is no longer of importance, contrary to opinions expressed on the matter.

Fig. 1. — View of the wireless installation, during the sending of a telegram.

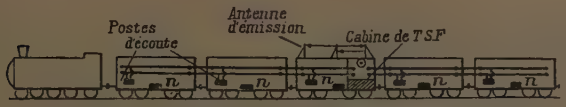

Fig. 2. — Diagram of the installation.

n = neutralisers.

Explanation of French terms:

Postes d'écoute = Listening-in points. — Antenne d'émission = Transmitting aerial.
Cabine de T. S. F. = Wireless station.

Besides wireless telephone reception on trains, the « Radio-Fer » Company has studied wireless telegraph communications between trains and fixed stations. This problem, partly solved at great expense in Canada and Germany, was here solved in an extremely economical manner, which should make possible in the near future the commercialisation of the method. A passenger is hereby enabled for a reasonable price to send a telegram from a train and to receive an answer under the same conditions.

The transmitting set adopted was invented by Mr. Bonnal, a particularly competent wireless amateur, who was the first to achieve communication between France and Siam. This transmitter works on short waves. The necessary power is taken from the train lighting

battery, by a method originated by Mr. Toussaint. By means of the system adopted, from a pressure of 20 volts, a strictly direct current can be obtained, since it is supplied by accumulators of a thousand volts, without any waste in rectifying from alternating current, by using tantalum electrolytic valves. The transmitting radius of the apparatus is thus distinctly improved. The stability of transmission is therefore, in spite of the swift movement of the train, quite sufficient to allow of messages being easily picked up, although the power in use does not exceed 50 watts.

The transmission and reception of telegrams is done on short waves of about 47 metres. The transmission is done by means of an aerial placed on top of the carriage in which the wireless station is situated (fig. 2.). Telegrams are sent by the Morse code; — in the first trials, they were picked up by a little private station established at Bois-Colombes. In regular use, they should be sent to the General Post Office's station at Villejuif, which forwards them in the ordinary way.

The reception of broadcast programmes is done, in principle, by means of a frame aerial. The installation adopted is of the two-grid superheterodyne type. A special arrangement (fig. 4) has been adopted to deaden atmospherics, and to neutralise any oscillating currents which may be generated in the train lighting dynamos. The operator on the train tunes in to the French or foreign stations which are broadcasting during the journey, chosing the best programme with the best reception. These programmes include concerts, talks, general news, stock exchange news, etc. When there is no broadcasting going on, the passengers can listen to gramophone records by means of a pick-up amplifier fed by the train lighting batteries. The operator can also transmit to the passengers a running commentary on the country through

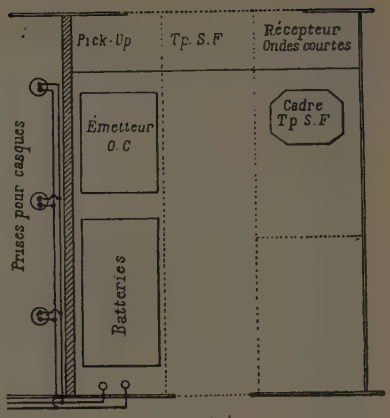

Fig. 3. — Diagram of the station, located in a compartment.

Explanation of French terms:

Cadre Tp. S. F. = Frame aerial. — Couloir = Corridor — Émetteur O. C. = Short wave transmitter. — Prises pour casques = Plug in points for head phones. — Récepteur ondes courtes. = Short wave receiver.

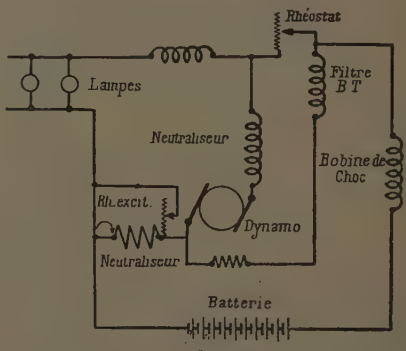

Fig. 4.
Diagram of the neutralising arrangement.

Explanation of French terms:

Bobine de choc = Choke-coil. — Filtre B. T. = L. T. filter. — Lampes = Lamps. — Neutraliseur = Neutraliser. — Rh. excit. = Excitation rhéostat.

which they are travelling, announcing the next stop, and the stopping time in the station, giving the names of the principal hotels of the locality, and describing its resources and special features, etc. The sending to the operator at certain fixed stations of telegrams keeping him in touch with important items of news occurring after the train started has also been provided for; the operator can immediately transmit these to the passengers. Such a service is especially interesting for very long journeys.

In order to listen in, the passenger, for a small fee (5 francs for the Paris-Havre journey) hires a pair of head-

Fig. 5. — View of a compartment with accomodation for listening-in.

phones which are given to him wrapped up and disinfected. These headphones are fitted with a chord connection and a plug which has only to be inserted into a socket situated above each seat. With these head-phones, the traveller can listen-in without being disturbed by extraneous noises, not even that of the train itself. Furthermore such listening-in does not interfere with those who do not want to do so; the latter can speak among themselves without troubling those who are listening-in.

Wireless installation on trains has been very popular from the first; this excellent innovation is one of the many arrangements made by the State Railways on the initiative of their manager, Mr. Dautry, in order to increase the comfort and pleasure of railway journeys.

ERRATUM.

Bulletin, May 1931 number.

Article : « Automatic train control in England », p. 470, 2nd column 11th and 12th lines. — Instead of *acoustic control*, read *automatic control*.

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PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General secretary of the Permanent Commission of the International Railway Congress Association.

(JANUARY 1931)

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In French.

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Tables pour le tracé des courbes de chemins de fer, outes et canaux.

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Berechnung statisch unbestimmter Systeme. II. Teil, **Mehrteilige Rahmen** (Stockwerkrahmen, Vierendeelträger).

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1930 621 .114

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1930 691

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1930 656 .1 & 656 .261

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1930 625 .14

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1930 625 .154

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1930 656 .25 (.44)

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1930 621 .335

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1930 621 .132.8 (.43) & 621 .43 (.43)

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1930 625 .295 & 656 .225

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1930 656 .256

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1930 625 .172

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1930 625 .235 (.44)

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1930 665

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1930 625 .233

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VINCENT. — **L'éclairage électrique des trains de chemins de fer secondaires.** (3 200 mots & fig.)

1930 656 .1 & 656 .2

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1930 656 .1 & 656 .2

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1930 656 .21 (.44)

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CHAUDRE. — **Amélioration et extension des voies ferrées aux abords de Strasbourg.** (4 000 mots & fig.)

1930 656 .222.1 (.44)

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1930 385 .43 (.44)

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Résultats obtenus en 1929 sur les réseaux des cinq compagnies principales des chemins de fer français. (100 mots & 8 tableaux.)

1930 385 .113 (.42)

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1930 621 .116

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1930 385 .587 (.44)

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1930 385 .113 (.43)

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1930 656 .234 (.44)
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1930 385 .587 (.44)
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1930 385 .587 (.44)
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1930 385 .113 (.44)
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1930 313 .385 (.438)
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1930 385 .113 (.494)
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1930 669 .1
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1930 669
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1930 625 .214
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1930 385. (01 (.6)
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1930 656 .23 (0
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1930 385 .113 (.47)
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1930 385 .517 (.43)
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KUHATSCHECK (O.). — **Die Kranken- und Arbeiterpensionskassen, die Angestellten-, Unfall- und Arbeitslosenversicherung** bei der Deutschen Reichsbahn im Jahr 1929. (Schluss.) (12 500 Wörter & Tabellen.)

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Die **Betriebsergebnisse** der fünf grossen französischen Eisenbahngesellschaften im Jahr 1928. (Tabellen.)

1930 383 .113 (.73)
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1930 621 .335 (.43)
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1930 621 .335 (.43)
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1930 621 .131.3 & 621 .134.

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1930 621 .116 (.42)
Engineer, No. 3899, October 3, p. 373.
The Institute of Fuel. — Pulverised coal plants and mechanical stokers. (7 500 words & fig.)

1930 621 .392 (.42)
Engineer, No. 3900, October 10, p. 393.
The fusion welding of pressure vessels. (2 300 words.)

1930 669 .1
Engineer, No. 3900, October 10, p. 408.
HATFIELD (W. H.). — Permanence of dimensions under stress at elevated temperatures. (3 700 words, 4 tables & fig.)

1930 669 .1
Engineer, No. 3901, October 17, p. 418.
ENGLESSON (E.). — Pitting in water turbines. (3 900 words & fig.)

1930 621 .13 (0 (.47)
Engineer, No. 3901, October 17, p. 422.
The Russian locomotive problem. (1 700 words.)

1930 385 (.42)
Engineer, No. 3901, October 17, p. 430.
The future of British railways. (1 400 words.)

1930 625 .253 (.485)
Engineer, No. 3902, October 24, p. 460.
The « transit » air brake for railway vehicles. (2 000 words & fig.)

1930 621 .132.3 (.42)
Engineer, No. 3902, October 24, p. 462.
High-pressure locomotives. (4 000 words.)

1930 385 .586
Engineer, No. 3903, October 31, p. 488.
London & North Eastern Railway signalling school at York. (4 000 words & fig.)

1930 621 .116 (06 (08 (.42)
Engineer, No. 3903, October 31, p. 489.
The Institute of Fuel. Annual 2-days' Conference 22-23 October 1930 (to be continued). (2 300 words & fig.)

1930 625 .143.2
The Metallurgist, October 31, p. 147, supplement to the Engineer.
High temperature tensile properties of rail steels. (1 000 words.)

1930 62. (01 & 669
The Metallurgist, October 31, p. 154, supplement to the Engineer.
The failure of metals under stress. (2 500 words.)

1930 669 .1
The Metallurgist, October 31, p. 158, supplement to the Engineer.
Fractures in boiler metal. (1 100 words.)

1930 621 .1
Engineer, No. 3904, November 7, p. 518.
BAUMANN (K.). — Some considerations affecting future development of the steam cycle. (6 600 words & fig.)

1930 621 .392
Engineer, No. 3905, November 14, p. 540.
Heavy duty butt flash welding machines. (600 words.)

1930 621 .1
Engineer, No. 3905, November 14, p. 544.
Future development of the steam cycle. (3 800 words.)

1930 656 .283 (.42)
Engineer, No. 3905, November 14, p. 547.
The Euston **buffer stop collision.** (1 000 words.)

1930 656 .222.1
Engineer, No. 3906, November 21, p. 560
MARSHALL (C. F. D.). — Side wind and the **resistance of trains.** (1 100 words.)

1930 625 .13 (.42)
Engineer, No. 3906, November 21, p. 565.
CALLUM (R. T. Mac). — **The opening out of Cofton tunnel,** London Midland & Scottish Railway. (800 words.)

1930 621 .116
Engineer, No. 3906, November 21, p. 566.
DOREY (S. F.). — **Tubes for high-pressure water-tube boilers.** (7 500 words & fig.)

1930 621 .33 (.45)
Engineer, No. 3906, November 21, p. 571.
Railway electrification in Italy. (1 300 words.)

1930 656 .254 (.42)
Engineer, No. 3907, November 28, p. 592.
Wireless on trains. (900 words.)

1930 621 .132.8 (.42)
Engineer, No 3907, November 28, p. 595.
A 200 horse-power **steam rail coach.** (900 words & fig.)

1930 621. (06 (.42) & 621 .116
Engineer, No. 3907, November 28, p. 596.
Institution of Mechanical Engineers. — **Heat transfer from tube to water.** (2 200 words.)

1930 621 .94
Engineer, No. 3907, November 28, p. 603.
A new design of combination **turret lathe.** (2 700 words & fig.)

1930 621 .116.1
Engineer, No. 3907, November 28, p. 605.
EAGLE (A.). — **The coefficients of heat transfer from tube to water.** (5 700 words, 1 table & fig.)

1930 625 .143.2
The Metallurgist, November 28, p. 163, supplement to the Engineer.
Properties of some special rail steels. (1 000 words, 3 tables & fig.)

1930 669
The Metallurgist, November 28, p. 167, supplement to the Engineer.
Heat treatment. (1 400 words, 2 tables & fig.)

1930 669
The Metallurgist, November 28, p. 170, supplement to the Engineer.
Some American researches on the **fatigue of metals.** (2 200 words & fig.)

1930 624 .8 (.42)
Engineer, No. 3908, December 5, p. 614.
Renewal of Folkestone harbour swing bridge. (500 words & fig.)

1930 656 .253 (.42)
Engineer, No. 3908, December 5, p. 626.
Automatic train control. (1 700 words.)

Engineering. (London.)

1930 621 .132.6 (.42)
Engineering, No. 3377, October 3, p. 428.
GRESLEY (H. N.). — 2-6-2 type **tank locomotive;** London and North Eastern Railway. (500 words & fig.)

1930 621 .132.3 (.73) & 621 .132.5 (.73)
Engineering, No. 3377, October 3, p. 443.
4-8-4 type locomotive for the Chicago and North-Western Railway. (1 600 words & fig.)

1930 624 .2
Engineering, No. 3377, October 3, p. 445.
BATHO (C.). — Theory and experiment in **structural-steel design.** (4 200 words.)

1930 625 .13 (.73)
Engineering, No. 3378, October 10, p. 449.
BAKER (A. R.). — The **Oakland-Alameda Estuary tube.** (4 500 words & fig.)

1930 385. (09.1 (.54) & 385 .11 (.54)
Engineering, No. 3379, October 17, p. 496.
Indian Railway progress. (1 500 words.)

1930 625 .4 (.73)
Engineering, No. 3380, October 24, p. 509.
SKINNER (F. W.). — New York **electric subway construction methods.** — II. (3 100 words & fig.)

1930 621 .132.8 (.54)
Engineering, No. 3380, October 24, p. 520.
2-6-2 + 2-6-2-type **locomotive;** Great Western Railway of Brazil. (900 words & fig.)

1930 691
Engineering, No. 3380, October 24, p. 526.
The deterioration of structures in seawater. (1 700 words.)

1930 621 .4
Engineering, No. 3380, October 24, p. 532.
DAVIES (S. J.) and GIFFEN (E.). — The present position of the **high-speed heavy-oil engine.** (4 900 words, 4 tables & fig.)

1930 621 .392 & 669 .1
Engineering, No. 3380, October 24, p. 538.
SCHUSTER (L. W.). — The effect of contamination by nitrogen on the structure of **electric welds.** (1 400 words & fig.)

1930 621 .116 & 669 .1
Engineering, No. 3381, October 31, p. 544.
Materials for high-pressure installations. (1 700 words.)

1930 385 .57
Engineering, No. 3381, October 31, p. 558.
Shop tests for engineering employees. (1 000 words.)

1930 624 .62 (.944)
Engineering, No. 3381, October 31, p. 559.
The Sydney harbour bridge. (4 000 words.)

1930 621 .116
Engineering, No. 3382, November 7, p. 573.
NIELSEN (H.). — **Powdered-fuel firing in restricted furnace spaces.** (3 600 words, 8 tables & fig.)

1930 621 .1
Engineering, No. 3382, November 7, p. 597; No. 3384, November 21, p. 661; No. 3386, December 5, p. 723.
BAUMANN (K.). — **Some considerations affecting future developments of the steam cycle.** (12 600 words, 1 table & fig.)

1930 669 .1
Engineering, No. 3382, November 7, p. 601.
HATFIELD (W. H.). — **Permanence of dimensions under stress at elevated temperatures.** (4 600 words & 4 tables.)

1930 625 .13 (.73)
Engineering, No. 3383, November 14, p. 605; No. 3386, December 5, p. 702.
The Detroit-Windsor tunnel. (6 900 words & fig.)

1930 621. (06 (08 (.42)
Engineering, No. 3383, November 14, p. 626; No. 3386, November 28, p. 708.
The Institution of Mechanical Engineers; North-Western branch (Abstracts of Proceedings). (5 400 words.)

1930 621 .6 (.42)
Engineering, No. 3383, November 14, p. 629.
The Benes fuel pump for high-speed oil engines. (1 100 words & fig.)

1930 621 .116 (.42)
Engineering, No. 3383, November 14, p. 632.
A 1 000-hour trial on a 1 700 lb. Löffler boiler. (2 800 words & fig.)

1930 669 .1
Engineering, No. 3383, November 14, p. 635.
TWYMAN (F.). — **The quantitative analysis of steels by spectrum analysis.** (2 500 words, 1 table & fig.)

1930 621 .132.8 (.45) & 621 .43 (.45)
Engineering, No. 3384, November 21, p. 645.
4-6-2 type Ansaldo Diesel locomotive. (1 500 words & 2 tables.)

1930 624. (06 (08 & 69 (06 (08
Engineering, No. 3384, November 21, p. 666.
The report of the second International Congress for bridge and structural engineering. (400 words.)

1930 621. (06 (.42) & 621 .116
Engineering, No. 3385, November 28, p. 687.
Heat transfer from tube walls to water. The Institution of Mechanical Engineers. (3 900 words & fig.)

1930 621 .116
Engineering, No. 3385, November 28, p. 691.
EAGLE (A.) and FERGUSON (R. M.). — **The coefficients of heat transfer from tube to water.** (To be continued.) (5 500 words & fig.)

1930 621 .132.3 (.593)
Engineering, No. 3385, November 28, p. 697.
4-6-0 type locomotive for the Government of Hong-Kong. (700 words & fig.)

1930 621 .33
Engineering, No. 3386, December 5, p. 716.
Standardisation in electric traction. (1 300 words.)

Engineering News-Record. (New York.)

1930 624 .51 (.73)
Engineering News-Record, 2 October, p. 529.
MARTIN (John T.). — **Erection of 276-ft. towers for Mid-Hudson suspension bridge** at Poughkeepsie. (1 500 words & fig.)

1930 621 .139 & 665 .882
Engineering News-Record, 2 October, p. 540.
Welding Society discusses tests and practice. (1 600 words.)

1930 656 .211 (.71) & 725 .31 (.71)
Engineering News-Record, 9 October, p. 562.
Active work begins on large railway terminal at Montreal. (1 500 words & fig.)

1930 656 .211 (.73) & 725 .31 (.73)
Engineering News-Record, 9 October, p. 562.
Pennsylvania Railroad opens new suburban terminal at Philadelphia. (1 000 words & fig.)

1930 624. (0 (.73)
Engineering News-Record, 9 October, p. 572.
PESSES (Irving L.). — **Silicon steel used liberally in 1 257-ft. continuous truss bridge.** (1 400 words & fig.)

1930 624 .8 (.73)
Engineering News-Record, 16 October, p. 613.
GRONQUIST (C. H.). — **Reconstructing failed bascule bridge** over Hackensack river. (800 words & fig.)

1930 621 .392 (.73) & 656 .211.5 (.73)
Engineering News-Record, 16 October, p. 617.
Station **platform roofs redesigned for welded connections.** (400 words & fig.)

1930 624 .62 (.73)
Engineering News-Record, 23 October, p. 640.
Closing a 1 652-ft. **steel arch-bridge** 250 ft. off center. (2 000 words, table & fig.)

1930 624 .62 (.944)
Engineering News-Record, 23 October, p. 646.
Erecting the Sydney harbor **steel-arch bridge.** (800 words & fig.)

1930 625 .4 (.52)
Engineering News-Record, 23 October, p. 655.
SAKAKIBARA (H.). — **Tokyo's underground railway.** (800 words & fig.)

1930 625 .1 (.73)
Engineering News-Record, No. 19, November 6, p. 734.
Santa Fe Railway **builds new line to Mexico.** (2 700 words & fig.)

1930 624 .7 (.73)
Engineering News-Record, No. 20, November 13, p. 778.
Two heavy spans floated into place to complete Hackensack river bridge. (1 700 words & fig.)

1930 625 .4 (.73)
Engineering News-Record, No. 21, November 20, p. 796.
New York subway construction. — IV. **Shield tunnels with precast-concrete block lining.** (2 500 words, 1 table & fig.)

Great Western Railway Magazine. (London.)

1930 625 .143.3 (.42) & 621 .392 (.42)
Great Western Ry. Magazine, December, p. 499.
QUATERMAINE (A. S.). — **Repair of permanent way by electric welding.** (700 words & fig.)

1930 656 .253 (.42)
Great Western Ry. Magazine, December, p. 503.
The Great Western Railway system of **automatic train control.** (750 words & fig.)

Institution of Engineers, Australia. (Sydney.)

1930 624 (.945)
Institut. of Engineers, Australia, October, p. 369.
THOMAS (G. O.). — **The design and construction of Pyke's Creek bridge.** (8 000 words & fig.)

1930 621 .31
Institut. of Engineers, Australia, October, p. 398.
PODGER (S. G.). — **The rapid erection of wood pole transmission lines.** (3 300 words & fig.)

Journal of the Institute of Transport. (London.)

1930 385 .4 (.42) & 625 .26 (.42)
Journal of the Institute of Transport, July, p. 419.
LEMON (E. J. H.). — **Railway amalgamation** and its effect on the London Midland & Scottish Railway workshops. (Paper & discussion.) (15 500 words & fig.)

1930 656 .213
Journal of the Institute of Transport, July, p. 442.
BUCHANAN (G.). — **The economics of port development and administration.** (Paper & discussion.) (12 700 words.)

1930 656 .1 (.42)
Journal of the Institute of Transport, July, p. 469.
THOMSON (W. J.). — **Long distance omnibus services.** — Their place in the national scheme of transport (Paper & discussion). (7 700 words.)

1930 656
Journal of the Institute of Transport, November, p. 7.
Inaugural address by the Hon. Sir A. Stanley, G. B. E., C. B., M. V. O., President of the Institute, delivered in London on Monday, October 13th, 1930. (3 200 words.)

1930 31
Journal of the Institute of Transport, November, p. 15.
RYAN (M. F.). — **The application of statistics.** (1 600 words.)

1930 347 .763 (.42) & 656 .1 (.42)
Journal of the Institute of Transport, November, p. 19.
BRISTOW (F. G.). — **The Road Traffic Act, 1930.** (2 200 words.)

1930 656 .213
Journal of the Institute of Transport, November, p. 24.
TAPPER (W. E.). — **Congestion of traffic at ports.** (4 800 words.)

1930 385
Journal of the Institute of Transport, December, p. 64.
BELL (R.). — **The changing conditions of trade and transport.** (3 900 words.)

1930 614 .8 (.42)
Journal of the Institute of Transport, December, p. 73.
PICKARD (J. A. A.). — **Accident prevention.** (3 200 words & fig.)

1930 38
Journal of the Institute of Transport, December, p. 83.
LONG (S. S.). — **Transport as it affects industrial concerns.** (2 900 words.)

1930 385
Journal of the Institute of Transport, December, p. 88.
WOOD (W. V.). — **The economic position of railways.** (1 400 words.)

1930 656 .212.5
Journal of the Institute of Transport, December, p. 95.
BONNER (G. C.). — Some experiments in hump shunting on an Argentine Railway. (3 200 words.)

Journal, Permanent Way Institution. (London.)

1930 385 .586
Journal, Perm. Way Inst., April, p. 11.
ELLSON (G.). — Technical education of permanent way men. (2 000 words.)

1930 385. (09 (.493)
Journal, Perm. Way Inst., April, p. 65.
PEARSON (H. M.). — The Belgian railways. (4 700 words & fig.)

1930 625 .113 & 625 .15
Journal, Perm. Way Inst., April, p. 80.
GURD (R.). — Universal diagrams for ascertaining junction leads and radii. (600 words & 2 tables.)

1930 625 .17
Journal, Perm. Way Inst., April, p. 83.
BENDER (O. F. C.). — A new chapter in permanent way maintenance. (2 500 words.)

1930 625 .143.4
Journal, Perm. Way Inst., April, p. 92.
BUJAMA (H.). — Heavy current return rail bonding. (3 100 words & fig.)

1930 625 .142, 625 .143.2 & 625 .18
Journal, Perm. Way Inst., August, p. 152.
QUATERMAINE (A. S.). — The manufacture and inspection of permanent way materials. (5 000 words & figs.)

1930 625 .18
Journal, Perm. Way Inst., August, p. 169.
HOLLOWAY (H.). — Engineer's department stock records and accounts. (4 400 words.)

1930 656 .212.5
Journal, Perm. Way Inst., August, p. 183.
DOBINSON (H. M.). — Acetylene lighting of tunnels, railway tracks. (2 800 words & fig.)

London & North Eastern Railway Magazine. (London.)

1930 621 .138.5 (.42)
L. & N. E. Railway Magazine, November, p. 547.
THOM (R. A.). — Repairs to locomotives at Doncaster works. (1 400 words & fig.)

Mechanical Engineering. (New York.)

1930 385 .586
Mechanical Engineering, November, p. 963.
DONALD (W. J.). — Decentralized employee training. (10 000 words.)

Modern Transport. (London.)

1930 625 .232 (.42)
Modern Transport, No. 603, October 4, p. 3.
Sleeping car innovations on the London and North Eastern Railway. (2 000 words & fig.)

1930 625 .245 (.54)
Modern Transport, No. 603, October 4, p. 5.
Bogie hopper wagons for Bengal-Nagpur Railway. — Iron-ore wagons, of 63 tons capacity, with special door-operating mechanism. (600 words & fig.)

1930 656 .2
Modern Transport, No. 603, October 4, p. 7.
HARE (T. B.). — Practical railway operation. No. 26. — Passenger train working (continued). (1 000 words & fig.)

1930 656 .211 (.73) & 656 .212 (.73)
Modern Transport, No. 603, October 4, p. 10.
Passenger and goods traffic in Chicago. (1 400 words & fig.)

1930 625 .62 (06 (08 (.42)
Modern Transport, No. 603, October 4, p. 16.
Municipal tramways and transport. — Harrogate conference discuss costing systems and heavy oil engines. (12 000 words & fig.)

1930 625 .234 (.73)
Modern Transport, No. 604, October 11, p. 3.
Air conditioning equipment for dining cars. (1 200 words & fig.)

1930 625 .14 (.436)
Modern Transport, No. 604, October 11, p. 5.
STRAUSS (F.). — New system of permanent way construction. (2 000 words.)

1930 625 .245 (.54)
Modern Transport, No. 604, October 11, p. 7.
Dynamometer car for Indian State Railways. (700 words & fig.)

1930 385 .586 (.42)
Modern Transport, No. 604, October 11, p. 10.
Vocational training for railwaymen. (1 400 words & fig.)

1930 656 (.73)
Modern Transport, No. 604, October 11, p. 13.
Transport coordination in United States. (2 200 words.)

1930 656 (.42)
Modern Transport, No. 605, October 18, p. 2.
Present position of transport. (1 100 words.)

1930 385 .1
Modern Transport, No. 605, October 18, p. 3.
Future of the railways. — Need for changes resulting from progress of road transport. (3 000 words & fig.)

1930 656 .2

Modern Transport, No. 605, October 18, p. 5.

HARE (T. B.). — Practical **railway operation**: No. 27. — Statistics. (1 900 words.) — No. 606, October 25, p. 6; No. 28. — Conclusion. (2 200 words.)

1930 656 .28 (01 (02)

Modern Transport, No. 605, October 18, p. 9.

Railway accidents in Great Britain. (1 900 words & 2 tables.)

1930 656

Modern Transport, No. 605, October 18, p. 10.

BELL (R.). — **Changing conditions of transport and trade.** — The position of the railways. (2 000 words.)

1930 385. (01 (.67) & 624 .3 (.67)

Modern Transport, No. 606, October 25, p. 3.

The longest bridge in the world. — British engineers to build 11 650-ft. structure over Lower Zambesi River. (6 400 words & fig.)

1930 621 .122.8 (.43)

Modern Transport, No. 606, October 25, p. 11.

A unique **propeller-driven rail car.** (1 000 words & fig.)

1930 656 .253 (.42)

Modern Transport, No. 606, October 25, p. 24.

Automatic train control on Great Western Railway. (1 000 words & fig.)

1930 385 .586 (.42)

Modern Transport, No. 607, November 1, p. 3.

New London & North Eastern Railway **signalling school** at York. (2 700 words & fig.)

1930 625 .245 (.54)

Modern Transport, No. 607, November 1, p. 7.

New **dynamometer car** for Indian State Railways. (4 100 words & fig.)

1930 38

Modern Transport, No. 607, November 1, p. 10.

LONG (S. S.). — Economies from scientific **handling and despatch.** (2 500 words.)

1930 385. (09.1 (.497.2)

Modern Transport, No. 607, November 1, p. 13.

Railway improvements in Bulgaria. (900 words.)

1930 621 .33, 625 .255 & 625 .62

Modern Transport, No. 607, November 1, p. 19.

Regenerative braking. — **System** applied to Paris trams. (1 200 words.)

1930 385 .586

Modern Transport, No. 608, November 8, p. 3; No. 609. November 15, p. 9.

PICK (F.). — **Education for the railway service.** (7 700 words & fig.)

1930 385 (.54)

Modern Transport, No. 608, November 8, p. 5.

Reforms needed on Indian railways. (2 000 words & fig.)

1930 385 .3 (.42) & 656 .213 (.42)

Modern Transport, No. 608, November 8, p. 6.

Railway dock-charging powers. (2 000 words & fig.)

1930 659

Modern Transport, No. 608, November 8, p. 13.

WEDGWOOD (Sir Ralph L.). — **Publicity and the railways.** (2 200 words.)

1930 621 .132.8 (.42)

Modern Transport, No. 609, November 15, p. 3.

A new **articulated steam rail car.** (1 800 words & fig.)

1930 656 (.54)

Modern Transport, No. 609, November 15, p. 11.

Transport in India. — **Railway capital expenditure curtailed.** (2 200 words & fig.)

1930 621 .33 (.45)

Modern Transport, No. 610, November 22, p. 3

BIANCHI (G.). — **Railway electrification** in Italy. (3 300 words & fig.)

1930 621 .132.3 (.42)

Modern Transport, No. 610, November 22, p. 5.

Six-coupled express locomotives on the Great Western Railway. (4 200 words & fig.)

1930 385 .1

Modern Transport, No. 610, November 22, p. 7.

WOOD (W. V.). — **Economic position of the railways.** (2 300 words & fig.)

1930 656 .25 (.492)

Modern Transport, No. 610, November 22, p. 11.

DE VOS VAN NEDERVEEN CAPPEL (G. J.). — **Railway signalling** in Holland. (2 200 words & fig.)

1930 656 .1 & 656 .23

Modern Transport, No. 610, November 22, p. 13.

BALLANTYNE (J.). — **Railway charges** and road transport. (2 300 words & fig.)

1930 656 .254 (.42)

Modern Transport, No. 611, November 29, p. 3.

Wireless reception on trains. (1 700 words & fig.)

1930 656 .253 & 656 .256

Modern Transport, No. 611, November 29, p. 4.

PROUD (H. M.). — **Automatic signalling and train control.** (2 500 words & fig.)

1930 621 .335 & 621 .43

Modern Transport, No. 611, November 29, p. 6.

CHORLTON (A. E. L.). — **Diesel-electric traction** for railway services. (2 200 words.)

1930 656 .25 (0 (.42)
Modern Transport, No. 612, December 6, p. 3.
Increased safety on British railways. — Recommendations of train control Committee. (4 500 words & fig.)

1930 625 .244 (.73)
Modern Transport, No. 612, December 6, p. 5.
Iceless refrigerator cars on United States Railways. — Application of « Silica Gel » system. (2 700 words & fig.)

1930 656 .235.2 (.42)
Modern Transport, No. 612, December 6, p. 9.
Railway classification of goods. — Its origin and growth. (2 000 words.)

1930 656 .261 (.42)
Modern Transport, No. 612, December 6, p. 11.
Solving the collection and delivery problem. — A mechanical horse with hydraulic harness. (3 000 words & fig.)

1930 656 (94)
Modern Transport, No. 612, December 6, p. 20.
Problems of Australian transport. — Need for independence from political influence. (2 200 words.)

Proceedings, American Society of Civil Engineers. (New York.)

1930 624. (0
Proceed. Amer. Soc. civil Eng., October, p. 1901.
TURNER (C. A. P.) & JEPPESON (G.). — General specifications for steel railway bridges (Discussion). (7 300 words.)

1930 624 .2
Proceed. Amer. Soc. civil Eng., October, p. 1913.
FINLAY (A. H.), CAUGHEY (R. A.), PILKEY (O. H.) and OESTERBLOM (I.). — Analysis of continuous frames by distributing fixed-end moments. (7 900 words.)

1930 625 .13 (.73)
Proceed. Amer. Soc. civil Eng., November, p. 2037.
EREMIN (A. A.). — Completion of Moffat tunnel of Colorado (Discussion). (650 words & fig.)

Proceedings, Institution of Railway Signal Engineers. (Reading.)

1930 656 .25 (09 (.54)
Proceed. Institut. Ry. Signal Eng. Part I, February to September, p. 25.
DEAKIN (W. H.). — Reminiscences of an early signal engineer. (8 400 words.)

1930 656 .251
Proceed. Institut. Ry. Signal Eng. Part I, February to September, p. 47.
GRIFFITHS (R. S.) & LASCELLES (T. S.). — The problem of signal aspects : what must we tell the man on the footplate? (14 400 words & fig.)

1930 385 .586
Proceed. Institut. Ry. Signal Eng. Part I, February to September, p. 85.
WILSON (F. R.). — The training of the railway signal engineer. (8 800 words.)

Railway Age. (New York.)

1930 656 .225 (.73)
Railway Age, Section one, September 27, p. 609.
Handling fourteen thousand-ton trains. (2 500 words, tables & fig.)

1930 621 .139 (.73) & 625 .27 (.73)
Railway Age, Section one, September 27, p. 613.
Railway shop men review supply problems. (1 900 words & fig.)

1930 621 .132.5 (.73) & 656 .222.1 (.73)
Railway Age, Section one, September 27, p. 616.
New Wabash locomotives make good in service tests. (1 600 words, tables & fig.)

1930 625 .1 (06 (08 (.73)
Railway Age, Section one, September 27, p. 619.
Roadmasters' hold 48th convention. (6 100 words & figure.)

1930 656 .254 (06 (08 (.73)
Railway Age, Section one, September 27, p. 624.
Communication officers meet in Toronto. (3 200 words & fig.)

1930 656 .1 (.73)
Railway Age, Section two, September 27, p. 648.
YOUNG (L. B.). — Truck competition is taking the railways' carload traffic. (2 200 words & fig.)

1930 656 .1 (.73) & 656 .261 (.73)
Railway Age, Section two, September 27, p. 652.
Maintaining the Baltimore & Ohio train connection coaches. (2 000 words & fig.)

1930 621 .13 (0 & 621 .13 (06 (08 (.73)
Railway Age, 4 October, p. 685.
The locomotive of tomorrow. (Traveling Engineers' symposium.) (12 000 words & fig.)

1930 385 .1 (.73)
Railway Age, 4 October, p. 699.
SARGENT (Fred W.). — The drift toward confiscation. Fears disastrous effect that further curtailment of railway earnings may have upon national prosperity. (4 500 words.)

1930 625 .1 (06 (08 (.73)
Railway Age, 4 October, p. 707.
Roadmasters conclude most sucessful convention. (6 000 words.)

1930 621 .33 (.73)
Railway Age, 11 October, p. 734.
DUER (J. V. B.). — The Pennsylvania electrification. (2 500 words & fig.)

1930 621 .138.5 (.73) & 725 .33 (.73)
Railway Age, 11 October, p. 738.
Old **locomotive shop** is rebuilt without upsetting operations. (3 900 words & fig.)

1930 614 .8 (06 (08 (.73) & 656 .286 (.73)
Railway Age, 11 October, p. 745.
GALLOWAY (C. W.). — **Grade crossing accidents** discussed at safety council meetings. (7 300 words & fig.)

1930 621 .13 (06 (08 (.73)
Railway Age, 11 October, p. 751.
Traveling engineers' motive power symposium (concluded). (6 500 words.)

1930 614 .8 (06 (08 (.73) & 656 .286 (.73)
Railway Age, October 18, p. 789.
Shop and maintenance men talk on safety at Pittsburgh (Final meetings). (6 000 words & fig.)

1930 656 .231 (.73)
Railway Age, October 18, p. 795.
Traffic Clubs discuss trend toward **mileage rates.** (4 500 words & fig.)

1930 625 .216 (.73)
Railway Age, October 18, p. 800.
Alma draft gear tested in passenger service. (2 000 words, tables & fig.)

1930 656 .211 (06 (08 (.73) & 656 .224 (06 (08 (.73)
Railway Age, October 18, p. 803.
Passenger officers hold busy session at Atlantic city. (8 500 words.)

1930 385
Railway Age, No. 18, November 1, p. 920.
LISMAN (F. J.). — Best defense is the offensive. Further observations on **railroad problems,** inspired by the extensive comment and discussion which arose from the « **Diagnosis of railway ills** ». — Part I. (4 200 words.)

1930 385 .517.4
Railway Age, No. 18, November 1, p. 929.
LATIMER (M. W.). — Why fund the **railroad pension plan?** (3 200 words.)

1930 621 .392 (06 (08 (.73)
Railway Age, No. 18, November 1, p. 933.
Electrical men meet in Chicago. (2 500 words.)

1930 621 .139 (.73), 625 .18 (.73) & 656 .23 (.73)
Railway Age, No. 18, November 1, p. 937.
Reciprocity hearings adjourned. (7 500 words.)

1930 656 .1 (.73)
Railway Age, No. 20, November 15, p. 1015.
Economic equality of opportunity for the railways. (4 500 words.)

1930 656 .1 (.73)
Railway Age, No. 20, November 15, p. 1018.
Public reaction favors **control of trucks and coaches.** (4 000 words.)

1930 621 .132.5 (.73)
Railway Age, No. 20, November 15, p. 1025.
Chesapeake & Ohio receives large **two-cylinder locomotives.** (1 200 words & fig.)

1930 621 .392 (06 (08 (.73)
Railway Age, No. 20, November 15, p. 1028.
Electrical Section holds second annual meeting. (5 400 words & fig.)

1930 625 .4 (.73) & 656 .211 (.73)
Railway Age, No. 20, November 15, p. 1032.
Large **suburban terminal** opened in Philadelphia. (2 200 words & fig.)

1930 385 .517.1 (.73)
Railway Age, No. 20, November 15, p. 1039.
CADY (S. H.). — **Railroad pensions.** A suggested plan. (4 200 words.)

1930 621 .132.8 (.43)
Railway Age, No. 20, November 15, p. 1045.
New German **rail car.** (250 words & fig.)

1930 656
Railway Age, No. 20, November 15, p. 1046.
MATHEWS (C. H.). — **Air transport** making rapid strides. (3 200 words & fig.)

1930 621 .132.8 (.71)
Railway Age, No. 21, November 22, Section I, p. 1068.
Canadian National buys five **4-6-4 type locomotives.** (1 100 words & fig.)

1930 625 .1 (.73)
Railway Age, No. 21, November 22, Section I, p. 1071.
Cotton Belt reconstructs line in Texas. (5 000 words & fig.)

1930 385 .21 (.73)
Railway Age, No. 21, November 22, Section I, p. 1077.
Inland waters' transport costs exceed rail by 50 per cent. (15 000 words, fig. & map.)

1930 385 (.73)
Railway Age, No. 21, November 22, Section I, p. 1087.
Adopt program for railroads. (2 500 words.)

1930 385 (.73)
Railway Age, No. 21, November 22, Section I, p. 1089.
Railway Business Association meets in New York. (3 500 words.)

1930 385 .3 (.73)
Railway Age, No. 21, November 22, Section I, p. 1091.
Railroad Commissioners meet at Charleston, S. C. (12 000 words.)

1930 385 .3 (.73) & 656 .1 (.73)
Railway Age, No. 21, November 22, Section I, p. 1097.
Interstate Commerce Commission opens hearings on **rail-highway service.** (3 000 words.)

1930 625 .242 (.73)
Railway Age, No. 21, November 22, Section I, p. 1099.
A **65-ft. gondola car** for the New Jersey Central. (300 words & fig.)

1930 625 .234 (.73)
Railway Age, No. 21, November 22, Section I, p. 1099.
Baltimore & Ohio cools the air in sleeping cars. (350 words & fig.)

1930 656 .1 (06 (08 (.73)
Railway Age, No. 21, November 22, Section I, p. 1116.
Motor Transport Division holds meeting in Chicago. (26 000 words, 5 tables & fig.)

1930 656 .1 (.73)
Railway Age, No. 21, November 22, Section I, p. 1137.
Store-door service popular on West Coast. (2 600 words & fig.)

Railway Engineer. (London.)

1930 621 .135.3 & 625 .13
Railway Engineer, November, p. 406.
Springing of locomotives and rolling stock. (600 words.)

1930 625 .143.4
Railway Engineer, November, p. 406.
The weight of rails. (500 words.)

1930 621 .135.3 & 625 .13
Railway Engineer, November, p. 409 & 429.
SQUIRE (C. E.). — **The design and performance of railway springs.** A scientific study of a leading problem identified with the construction of locomotives and rolling stock. (3 200 words, tables & fig.)

1930 621 .132.8
Railway Engineer, November, p. 415 & 429.
New **Beyer-Garratt locomotives,** Benguela Railway. (1 600 words & fig.)

1930 621 .138.5 (.42)
Railway Engineer, November, p. 417.
The Derby **locomotive works** of the London Midland & Scottish Railway. — II. (3 500 words, fig. & forms.)

1930 621 .132.8 & 621 .43
Railway Engineer, November, p. 425.
GEIGER (Dr. J.). — **Diesel locomotive design.** — II. (3 400 words & fig.)

1930 625 .245 (.54)
Railway Engineer, November, p. 431.
New dynamometer car, Great Indian Peninsula Railway. (3 400 words & fig.)

1930 621 .132.8
Railway Engineer, December, p. 446.
Articulated express locomotives. (1 300 words.)

1930 621 .392 (.42) & 625 .143.3 (.42)
Railway Engineer, December, p. 447.
Increasing **life of rails and crossings.** (600 words.)

1930 625 .1 (.42)
Railway Engineer, December, p. 449.
New **Lewisham connecting lines,** Southern Railway. (2 200 words & fig.)

1930 656 .25 (.492)
Railway Engineer, December, p. 455.
Railway signalling in Holland. (1 400 words & fig.)

1930 625 .232 (.62 + .81)
Railway Engineer, December, p. 457.
New **passenger rolling-stock** for railways abroad. (2 400 words & fig.)

1930 625 .143.4
Railway Engineer, December, p. 463.
ABBERY (R. C.). — **The failure of fishplates.** (1 200 words & fig.)

1930 625 .22
Railway Engineer, December, p. 466.
DENDY MARSHALL (C. F.). — **The motion of railway vehicles on a curved line.** — III. (1 800 words & fig.)

1930 621 .132.3 (.42)
Railway Engineer, December, p. 469.
Reconstructed « Claughton » locomotives, London Midland & Scottish Railway. (400 words & fig.)

1930 625 .233
Railway Engineer, December, p. 470.
COPPOCK (C.). — **Electric train-lighting equipment.** — XIII. (2 100 words & fig.)

1930 621 .132.6 (.492)
Railway Engineer, December, p. 473.
New **four-cylinder 4-8-4 type tank locomotives,** Netherlands Railways. (200 words & fig.)

1930 625 .214
Railway Engineer, December, p. 474.
An improved **axlebox for rolling stock.** (800 words & fig.)

1930 621 .132.1 (.73)
Railway Engineer, December, p. 477.
POULTNEY (E. C.). — **Some modern American passenger locomotives.** — II. (2 100 words & fig.)

1930 625 .113
Railway Engineer, December, p. 480.
HEARN (G. R.). — **Re-grading the permanent way.** (2 300 words & fig.)

1930 621 .132.6 (.42)
Railway Engineer, December, p. 482.
New 2-6-2 type **tank locomotive,** London & North Eastern Railway. (600 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1930 625 .175
Railway Engineering and Maintenance, Nov., p. 483.
KNOWLES (C. R.). — **Operating motor cars safely.** (2 600 words & fig.)

1930 625 .172 (.73)
Railway Engineering and Maintenance, Nov., p. 485.
Novel **weed-spraying equipment.** (450 words & fig.)

1930 625 .173 (.73)
Railway Engineering and Maintenance, Nov., p. 486.
A ten-year ballast program. (3 400 words & fig.)

1930 625 .144.1 (.73) & 665 .882 (.73)
Railway Engineering and Maintenance, Nov., p. 491.
DEPPELER (J. H.). — Thermit **weld rail joints** in main line tracks. (3 500 words & fig.)

1930 625 .1 (06 (08 (.73) & 624. (06 (08 (.73)
Railway Engineering and Maintenance, Nov., p. 495.
Bridge Men meet at Louisville. (23 000 words & fig.)

Railway Gazette. (London.)

1930 625 .232 (.42)
Railway Gazette, October 3, p. 433.
New first-class **sleeping cars,** London & North Eastern Railway. (1 100 words & fig.)

1930 625 .245 (.42)
Railway Gazette, October 3, p. 435.
New **20-ton hopper wagons,** London Midland & Scottish Railway. (300 words & fig.)

1930 625 .245 (.54)
Railway Gazette, October 3, p. 438.
New **iron ore bogie hopper wagons** for the Bengal-Nagpur Railway. (500 words & fig.)

1930 621 .132.8 (.942) & 625 .4 (.942)
Railway Gazette, October 3, p. 439.
Rail car operation in Australia. (1 700 words & fig.)

1930 388 (.42)
Railway Gazette, October 10, pp. 456 & 474.
London traffic co-ordination. (1 100 words.) **Co-ordination of London passenger transport.** (1 300 words.)

1930 625 .232 (.82)
Railway Gazette, October 10, p. 461.
New **dining cars** for the Central Argentine Railway. (1 000 words & fig.)

1930 385 .586 (.42)
Railway Gazette, October 10, p. 467.
The new « **Underground** » **training school at Lambeth.** (1 300 words & fig.)

1930 625 .245 (.54)
Railway Gazette, October 10, p. 468.
New **dynamometer car,** Great Indian Peninsula Railway. (2 000 words & fig.)

1930 656 .281 (.42)
Railway Gazette, October 10, pp. 476 & 478.
Railway accident report. — **Derailment at Weaver junction,** London Midland & Scottish, January 14, and at Kent House, Southern, January 23. (4 000 words & fig.)

1930 656 .23
Railway Gazette, October 17, p. 494.
The gradation of traffic values. (1 000 words.)

1930 625 .232 (.42)
Railway Gazette, October 17, p. 503.
New **bogie corridor carriages** for the Southern Railway. (500 words & fig.)

1930 625 .242 (.42)
Railway Gazette, October 17, p. 504.
50-ton sulphate of ammonia wagons, London & North Eastern Railway. (350 words & fig.)

1930 656 .253 (.42)
Railway Gazette, October 24, p. 525.
Automatic train control on the Great Western Railway. (400 words, fig. and map.)

1930 625 .245 (.42)
Railway Gazette, October 24, p. 526.
Convertible wagons for the Queensland Railways. (300 words & fig.)

1930 656 .1 (.42)
Railway Gazette, October 24, p. 528.
The Northern General Transport Co. Ltd. (1 900 words & fig.)

1930 656 .1 (.42)
Railway Gazette, October 24, p. 535.
The new London coastal **coach station.** (1 100 words & maps.)

1930 385 .586 (.42)
Railway Gazette, October 31, p. 561.
London & North Eastern Railway (North-Eastern area) **signalling school at York.** (2 400 words & fig.)

1930 621 .132.3 (.42)
Railway Gazette, October 31, p. 567.
New **ultra-high-pressure compound express locomotive,** Paris-Lyons-Mediterranean Railway. (1 000 words & fig.)

1930 385 .62 (.41)
Railway Gazette, October 31, p. 571.
Inter-European time-table and through carriage conference. (800 words, 1 map & fig.)

1930 621 .338 (.82)
Railway Gazette, No. 19, November 7, p. 593.
Semi-steel electric coaches, Central Argentine Railway. (700 words & fig.)

1930 621 .9
Railway Gazette, No. 19, November 7, p. 595.
Woodworking machines for railway shops. (750 words & fig.)

1930 621 .132.6 (.91)
Railway Gazette, No. 19, November 7, p. 596.
4-6-4 tank locomotives for the Federated Malay States Railways. (400 words & fig.)

1930 625 .232 (.43)
Railway Gazette, No. 19, November 7, p. 601.
New **third-class steel corridor coaches** in Germany. (500 words & fig.)

1930 621 .132.3 (.51)
Railway Gazette, No. 20, November 14, p. 625; No. 21, November 21, p. 705.
New **4-6-2 type locomotives** for the Nanking-Shanhai Railway. (1 900 words & fig.)

1930 621 .132.8 (.42)
Railway Gazette, No. 20, November 14, p. 631; No. 21, November 21, p. 668.
New « Sentinel-Cammell » **articulated steam rail car.** London and North Eastern Railway. (3 100 words & fig.)

1930 621 .132.3 (.42)
Railway Gazette, No. 20, November 14, p. 634.
Reconstructed « Claughton » locomotives. London Midland and Scottish Railway. (500 words & fig.)

1930 656 .254 (.44)
Railway Gazette, No. 21, November 21, p. 665.
Wireless telephony and telegraphy on the French State Railways. (1 200 words & fig.)

1930 625 .156
Railway Gazette, No. 22, November 28, p. 709.
A new **railway buffer stop.** (900 words & fig.)

1930 656 .254 (.42)
Railway Gazette, No. 22, November 28, p. 713.
Wireless receiving installation on London & North Eastern Railway express. (1 200 words & fig.)

1930 385. (06 (.54)
Railway Gazette, No. 22, November 28, p. 714.
The Indian Railway Conference Association. (1 400 words & fig.)

1930 621 .87 (.67)
Railway Gazette, No. 22, November 28, p. 716.
New **20-ton breakdown crane** for the Central Africa Railway Co. Ltd. (350 words & fig.)

1930 656 .255
Railway Gazette, No. 23, December 5, p. 742.
The singling of double lines of railway, Great Southern Railways of Ireland. — I. (1 200 words & fig.)

1930 656 .253 (.42)
Railway Gazette, No. 23, December 5, p. 746.
The Automatic Train Control Committee's report. (800 words.)

1930 656 .253 (.44)
Railway Gazette, No. 23, December 5, p. 747.
Colour light signals on French railways. (500 words & fig.)

1930 656 .261 (.42)
Railway Gazette, No. 23, December 5, p. 749.
The Karrier. — London Midland & Scottish, « **mechanical horse** ». (1 100 words & fig.)

1930 621 .132.6 (.492)
Railway Gazette, No. 23, December 5, p. 753.
New **4-8-4 type four-cylinder tank engines** for the Netherlands Railways. (300 words.)

1930 656 .211.5 (.42)
Railway Gazette, No. 23, December 5, p. 754.
New bunch-hopper railway ticket machine. (1 000 words & fig.)

Railway Magazine. (London.)

1930 385. (09 (.42)
Railway Magazine, September, p. 173.
The Liverpool and Manchester Railway 1830-1930. (3 300 words & fig.)

1930 656 .222.1 (.42)
Railway Magazine, November, p. 368; December, p. 473.
ALLEN (C. J.). — **British locomotive practice and performance.** (11 900 words & fig.)

Railway Mechanical Engineer. (New York.)

1930 625 .235 (06 (08 (.73)
Railway Mechanical Engineer, October, pp. 547 & 565.
Equipment painting section meets at Chicago. (2 100 words & fig.)

1930 621 .9 (06 (08 (.73)
Railway Mechanical Engineer, October, pp. 550 & 568.
Tool foremen's annual convention at Chicago. (2 000 words & fig.)

1930 621 .13 (06 (08 (.73)
Railway Mechanical Engineer, October, pp. 554 & 572.
Traveling engineers hold constructive convention. (3 000 words & fig.)

1930 625 .26 (06 (08 (.73)
Railway Mechanical Engineer, October, pp. 557 & 570.
General foremen hold twenty-fifth anniversary convention. (2 000 words & fig.)

1930 625 .26 (06 (08 (.73)
Railway Mechanical Engineer, October, pp. 559 & 569.
Blacksmiths' Association meets at Chicago. (1 600 words & fig.)

1930 625 .26 (06 (08 (.73)
Railway Mechanical Engineer, October, p. 561.
Car men rename organization « Car Department Officers' Association ». (5 300 words & fig.)

1930 621 .135.3 & 625 .13
Railway Mechanical Engineer, October, p. 569.
BUCKLEY (T. F.). — **Spring manufacturing and repairing.** (1 000 words.)

1930 625 .235 (.73)
Railway Mechanical Engineer, October, p. 578.
Modern equipment for the paint shop. (4 000 words & fig.)

1930 621 .138.1 (.73)
Railway Mechanical Engineer, November, p. 609.
A one-man **engine terminal.** Grand Trunk operates modern facilities at Bay City, Mich. (900 words & fig.)

1930 621 .132.5 (.73)
Railway Mechanical Engineer, November, p. 615.
Forty heavy **2-10-4 type locomotives** for the Chesapeake & Ohio. (2 500 words & fig.)

1930 621 .13 (06 (08 (.73)
Railway Mechanical Engineer, November, p. 624.
Further proceedings at Traveling Engineers' convention. (4 200 words & fig.)

1930 656 .223.2 (.73)
Railway Mechanical Engineer, November, p. 628.
Car men discuss billing and interchange rules. (9 000 words & fig.)

1930 621 .134.3
Railway Mechanical Engineer, November, p. 634.
TAYLOR (F. J.). — **Lentz poppet valves for locomotives.** (800 words & fig.)

Railway Signaling. (Chicago.)

1930 656 .257 (.71)
Railway Signaling, November, p. 389.
Canadian Pacific uses **centralized control machine for station interlocking.** (1 100 words & fig.)

1930 656 .257 (.73)
Railway Signaling, November, p. 392.
Electric interlocking speeds traffic on 4.5-mile section of the Pittsburgh & Lake Erie. (2 800 words, 2 tables & fig.)

1930 656 .257 (.73)
Railway Signaling, November, p. 397.
Automatic interlockers on the Minneapolis & St. Louis. (2 500 words & fig.)

1930 621 .392
Railway Signaling, November, p. 400.
GOODWIN (W. N.). — **The rectifier-type A.-C. instrument.** (2 500 words & fig.)

1930 656 .257 (.73)
Railway Signaling, November, p. 402.
Michigan Central reconstructs large **interlocking plant** at West Detroit. (1 700 words & fig.)

1930 656 .256.3 (.73)
Railway Signaling, November, p. 405.
Wabash equips 42-mile dense-traffic section of main line with **absolute permissive block signals.** (2 200 words & fig.)

1930 614 .8
Railway Signaling, November, p. 410.
GAULT (P. M.). — **An accident prevention program for linemen and signalmen.** (1 400 words.)

1930 721 .3
Railway Signaling, November, p. 413.
Blasting method of setting poles. (600 words & fig.)

The Institution of Engineers, Australia. (Sydney.)

1927 624 .2
The Inst. of Engin. Australia, Volume VIII, p. 3.
ROSS (C. N.). — Equivalent eccentricities due to secondary stresses or the equivalent eccentricity of loading for the compression members of trusses, caused by the secondary stresses. (6 000 words, 9 tables & fig.)

1927 656 .1
The Inst. of Engin. Australia, Volume VIII, p. 87.
DIMMITT (R. W.). — **Motor transport.** (13 000 words & fig.)

1927 691
The Inst. of Engin. Australia, Volume VIII, p. 121.
MACKENZIE (A. C.). — Notes upon the **destruction of wharf piles by crustacea and mollusca** in Australian harbours. (11 000 words & fig.)

1927 69
The Inst. of Engin. Australia, Volume VIII, p. 150.
WALTER LORD (A.) & COPE (R. H.). — **Practical proportioning and control of concrete mixtures.** (12 500 words & fig.)

1927 625 .12
The Inst. of Engin. Australia, Volume VIII, p. 190.
ROSS (C. N.). — **The pressure exerted on retaining walls by materials possessing some cohesive strength** (9 500 & fig.).

1927 624 .1 & 721
The Inst. of Engin. Australia, Volume VIII, p. 217.
HAWKEN (R. W. H.). — **Column design curves and correspondence.** (13 500 words & fig.)

1927 624 .2 & 69
The Inst. of Engin. Australia, Volume VIII, p. 255.
CHAPMAN (R. W.). — **The strength of rectangular concrete slabs.** (9 500 words, 6 tables & fig.)

1927 627
The Inst. of Engin. Australia, Volume VIII, p. 283.
DEBENHAM (A. J.). — **The port of Sydney.** (14 500 words & fig.)

1927 625 .1 (.941)
The Inst. of Engin. Australia, Volume VIII, p. 447.
CRESSWELL (H. A.). — Some features of **railway construction and maintenance** in Western Australia. (18 500 words & fig.)

In Spanish.

Los Transportes. (Madrid.)

1930 621 .133.3
Los Transportes, n° 289, 30 Septiembre, p. 305.
Desincrustadores para tubos de calderas. (600 palabras & fig.)

Revista de Obras Publicas. (Madrid.)

1930 624 .2 (01
Revista de Obras Publicas, n° 19, 1° de Octubre, p. 441.
MENDIZABAL (D.). — **Nuevos estudios sobre el « Impacto ».** (3 600 palabras & fig.)

1930 624 .63 (.460)
Revista de Obras Publicas, n° 20, 15 de Octubre, p. 468.
RIBERA (E.). — **Los puentes bajo carriles de hormigón y hormigón armado en España.** (900 palabras & fig.)

1930 721 .9
Revista de Obras Publicas, n° 21, 1° de Nov., p. 486.
CEBALLOS PABÓN (R.). — **Losas de hormigón armado, moldeadas en serie, para utilizar en tableros de puentes.** (1 400 palabras & fig.)

1930 624 .63 (.44)
Revista de Obras Publicas, n° 22, 15 de Nov., p. 504.
OCHOA DE RETANA (A.). — **El puente de Plougastel.** (1 500 palabras & fig.)

1930 624 .63 (.436)
Revista de Obras Publicas, n° 23, 1° de Dic., p. 530.
RIBERA (E.). — **Puentes de hormigón armado en Checoeslovaquia.** (300 palabras & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1930 624 .6 & 721 .4
Annali dei lavori pubblici, settembre, p. 781.
MIOZZI (E.). — **Nuovi metodi nella esecuzione delle volte.** (10 500 parole & fig.)

L'Ingegnere. (Roma.)

1930 313 : 385 .13 (.45)
L'Ingegnere, settembre, p. 582.
OTTONE (G.). — **La statistica delle ferrovie concesse.** (11 600 parole.)

1930 62. (01 & 721 .9
L'Ingegnere, ottobre, p. 674.
PUGNO (G. M.) e ZUNINI (B.). — Ricerche sperimentali sulla **elasticità e resistenza di pali in cemento armato.** (1 600 parole & fig.)

Notiziario tecnico. (Firenze.)

1930 621 .135.4
Notiziario tecnico, ottobre, p. 375.
Stabilità in curva dei rotabili. (1 400 parole & fig.)

1930 62. (01 & 621 .392
Notiziario tecnico, novembre, p. 419.
Prove sperimentali delle **saldature elettriche dei metalli.** (2 000 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1930 625 .2 (.45)
Rivista tecnica delle ferrovie ital., 15 settembre, p. 117.
STECCANELLA (A.). — **Il nuovo capitolato generale delle Ferrovie dello Stato per la fornitura del materiale rotabile.** (5 700 parole & fig.)

1930 621 .33 (.45)
Rivista tecnica delle ferrovie ital., 15 settembre, p. 129.
TOZZI (F.). — **Elettrificazione** della linea Sampierdarena-Ovada-Alessandria. (4 500 parole & fig.)

1930 621 .331 (.45)
Rivista tecnica delle ferrovie ital., 15 ottobre, p. 165.
NELSON (C.). — **Sottostazione di conversione** di Bologna (S. Viola) per la elettrotrazione ferroviaria. (7 000 parole & fig.)

1930 621 .112
Rivista tecnica delle ferrovie ital., 15 ottobre, p. 206.
GIOVENE (N.). — **Per le più alte pressioni e temperature del vapore d'acqua.** Le nuove tabelle sue costanti fisiche. (2 200 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1930 624 .62 (.492)
De Ingenieur, N^r 42, 17 October, p. 269.
WALLAND (J. P.). — **De brug voor gewoon verkeer** over den Ijssel bij het Katerveer. (8 000 woorden & fig.)

1930 624. (01
De Ingenieur, N^r 44, 31 October, p. 283.
VAN GENDEREN STORT (E. A.). — Enkele opmerkingen over het monteeren van **bruggen.** (5 000 woorden & tafereelen.)

Spoor- en Tramwegen. (Utrecht.)

1930 **385. (09.3**

Spoor- en Tramwegen, Nr 7, 30 September, p. 185.

ASSELBERGHS (H.). — **Een honderd-jarige en hoe de eerste stappen op het ijzeren pad gezet werden.** (Vervolg en slot van blz. 10.) (3 000 woorden & fig.)

1930 **621 .132.5 (.492)**

Spoor- en Tramwegen, Nr 7, 30 September, p. 194.

LABRIJN (P.). — Nieuwe **tenderlocomotieven** voor de Nederlandsche Spoorwegen. (1 300 woorden, tafereel & fig.)

1930 **625 .162 (.92)**

Spoor- en Tramwegen, Nr 8, 14 October, p. 208.

DE VOOGT (C. L.). — **De onbewaakte overwegen** bij de spoorwegen in Nederlandsch-Indië. (Wordt vervolgd). (1 600 woorden & fig.)

1930 **625 .234**

Spoor- en Tramwegen, Nr 9, 28 October, p. 234 & 236.

THYSSEN (H. F.). — **Treinverwarming.** (2 500 woorden.)

1930 **625 .162 (.92)**

Spoor- en Tramwegen, Nr 9, 28 October, p. 237.

DE VOOGT (C. L.). — **De onbewaakte overwegen** bij de spoorwegen in Nederlandsch-Indië. (Slot volgt.) (1 300 woorden, 1 fig. & tafereel.)

1930 **656 .1**

Spoor- en Tramwegen, Nr 10, 11 Novembe-, p. 253.

SIMON-THOMAS (W.). — **De vrachtauto, een gevaar voor de volkswelvaart.** (1 600 woorden.)

1930 **625 .162 (.92)**

Spoor- en Tramwegen, Nr 10, 11 November, p. 257.

DE VOOGT (C. L.). — **De onbewaakte overwegen** bij de spoorwegen in Nederlandsch-Indië. (Slot van blz. 237.) (1 500 woorden.)

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Elektrotechnische Zeitschrift. (Berlin.)

1931 621 .8 & 621 .3
Elektrotechnische Zeitschrift, Heft 1, 1. Januar, S. 1; Heft 2, 8 Januar, S. 34.
SCHIEBELER (C.). — Neuerungen bei elektrischen Ausrüstungen von **Hebezeugen und Transportmaschinen.** (Schluss folgt.) (6 500 Wörter & Abb.)

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1930 625 .26 (.43)
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DÖNGES (F. H.). — **Das Reichsbahnausbesserungswerk Berlin-Schöneweide.** (7 200 Wörter & Abb.)

1930 621 .131.3 & 621 .134.3
Glasers Annalen, Nr. 1284, 15. Dezember, S. 147.
ACHTERBERG (Th.). — Über die rechnerische Vorausbestimmung der günstigsten Fahrgeschwindigkeit von **Kolbenheissdampflokomotiven** einstufiger Dampfdehnung. (Fortsetzung folgt.) (4 300 Wörter & Abb.)

1931 621 .132.8 & 621 .42
Glasers Annalen, Nr. 1285, 1. Januar, S. 10.
Verschiebe-Lokomotiven mit Dieselmotorenantrieb und Kraftübertragung durch Zahnrädergetriebe. (700 Wörter & 2 Abb.)

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1930 656 .257
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TRAUTVETTER. — **Elektrische Weichenstellwerke** für Strassenbahnen mit Bedienung vom Wagen aus. (1 500 Wörter & Abb.)

1930 62. (01 & 621 .392
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BARTELS (W. B.). — Die **Dauerfestigkeit** ungeschweisster Guss- und Walzwerkstoffe. (3 500 Wörter & Abb.)

1930 621 .392
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FINK (W.). — Die Anwendung der **Lichtbogentheorie** auf die Schweissung. (3 200 Wörter & Abb.)

1930 62. (01 & 665 .882
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HOFFMANN (O. W.). — **Dauerfestigkeit geschweisster Stahlverbindungen.** (2 500 Wörter, 6 Tafeln & Abb.)

1930 **621 .392**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 46, 15. November, S. 1565.

SCHWARZ (E.). — Die Bedeutung der Einbrandtiefe beim **Lichtbogenschweissen** und die Mittel zu ihrer Verbesserung. (2 500 Wörter & Abb.)

1930 **621 .392**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 46, 15. November, S. 1573.

SCHMUCKLER (H.). — Fortschritte der **Schweisstechnik** im Stahlbau. (5 200 Wörter & Abb.)

1930 **665 .882**
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SAUERBREI (E.). — Sicherheitstechnische Fragen beim **Azetylenschweissen.** (5 200 Wörter & Abb.)

1930 **625 .143.3**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 48, 29. November, S. 1639.

MAST (P.). — Die **Lebensdauer der Schienen** des Eisenbahnoberbaues. (6 500 Wörter, 3 Tafeln & Abb.)

1930 **621 .134.3**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 48, 29. November, S. 1645.

NAJORK (E.) & WICHTENDAHL (R.). — Wirtschaftliche Betrachtungen über **Dampflokomotiven mit erhöhtem Wärmegefälle.** (3 900 Wörter & Abb.)

1930 **624 .52 (.944)**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 49, 6 Dezember, S. 1657.

BÖKLEN (R.). — Die neue **Brücke** über den Hafen von Sydney. (3 700 Wörter & Abb.)

1930 **621 .132.8 (.43) & 621 .43 (.43)**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 50, 13. Dezember, S. 1697.

NIEDERSTRASZER (L.). — **Leichte Motor-Verschiebelokomotiven** der Deutschen Reichsbahn. (3 900 Wörter & Abb.)

1930 **656 .212.5**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 51, 20. Dezember, S. 1717.

KAEMPF. — Die **Rangiertechniek** in Güterbahnhöfen im Lichte der Rationalisierung und Mechanisierung. (6 500 Wörter & Abb.)

1931 **621 .33 (.436)**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 3, 17. Januar, p. 68.

Der **elektrische Betrieb** der Österreichischen Bundesbahnen. (1 100 Wörter & Abb.)

1931 **665 .882**
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GABLER (K.). — **Einfluss der Azetylendrücke** auf die Güte der Schweissnaht. (2 600 Wörter, 2 Tafeln & Abb.)

1931 **624 .2**
Zeitschrift des Vereines Deutscher Ingenieure, Nr. 3, 17. Januar, S. 83.

SPÄTH (W.). — Neuere **Schwingungsprüfmaschinen.** (1 900 Wörter & Abb.)

In English.

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1930 **625 .162 (.73) & 656 .254 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, September, p. 65.

Grade crossings. — Report of Committee IX, American Railway Engineering Association. (9 700 words & fig.)

1930 **625 .22 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}., September, p. 95.

Report of special Committee on clearances, American Railway Engineering Association. (600 words & fig.)

1930 **625 .144.4 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, September, p. 99.

Ballast. — Report of Committee II, American Railway Engineering Association. (4 500 words.)

1930 **347 .75 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, September, p. 107.

Uniform general contract forms. — Report of Committee XX, American Railway Engineering Association. (2 900 words.)

1930 **621 .33 (.73), 656 .211 (.73) & 725 .31 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, September, p. 119.

The electrification of the Cleveland Union Terminal. (3 200 words & fig.)

1930 **624 & 669**
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 119.

Iron and steel structures. — Report of Committee XV, American Railway Engineering Association. (9 000 words & fig.)

1930 **385 .4 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 135.

Rules and organization. — Report of Committee XII, American Railway Engineering Association. (8 000 words.)

1930 **625 .12 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 165.

Roadway. — Report of Committee I, American Railway Engineering Association. (14 400 words & fig.)

1930 **385 .5 (.73)**
Bull. Amer. Ry. Eng. Ass^{on}, October, p. 193.

Economics of railway labor. — Report of Committee XXII, American Railway Engineering Association. (7 200 words.)

1930 625 .143.0 (.73)
Bull. Amer. Ry. Eng. Ass^on, October, p. 205.
Report of Special Committee on stresses in railroad track. (700 words.)

Electric Railway Journal. (New York.)

1930 385. (072 (.73)
Electric Railway Journal, December, p. 732.
Research department aids **railway operations.** (3 500 words & fig.)

1930 621 .33 (.73)
Electric Railway Journal, December, p. 741.
Philadelphia **sample car** uses single-reduction drive with high-speed motors and magnetic brakes. (1 700 words & fig.)

1930 621 .33 (.75)
Electric Railway Journal, December, p. 747.
DOUB (C. L.). — Reliability features Reading's **power supply.** (3 900 words & fig.)

1930 621 .33 (.73)
Electric Railway Journal, December, p. 753.
Trolley bus operation proves advantageous at Detroit. (2 300 words & fig.)

1930 625 .234 (.73)
Electric Railway Journal, December, p. 755.
Heating passenger trains on electrified steam railroads. (1 400 words.)

1930 621 .33 (.44) & 625 .62 (.44)
Electric Railway Journal, December, p. 757.
Regenerative equipment planned for Paris tramcars. (3 700 words & fig.)

1931 385 .113 (.73)
Electric Railway Journal, January, p. 3.
Electric railways make good showing in a year of uncertainty. (2 600 words & fig.)

1931 385 .113 (.73)
Electric Railway Journal, January, p. 7.
Expenditures for new equipment and maintenance reach high figure. (2 500 words & fig.)

1931 385 .114 (.73)
Electric Railway Journal, January, p. 11.
RICHEY (A. S.). — **Fares and wages rise. Costs decline during 1930.** (1 800 words & fig.)

1931 625 .1 (.73)
Electric Railway Journal, January, p. 14.
Track activity well sustained. (3 500 words & fig.)

1931 313 .656.1 (.73)
Electric Railway Journal, January, p. 27.
STAUFFER (J. R.). — **Bus service and equipment increased.** (4 500 words & fig.)

1931 621 .33 (.73) & 6
Electric Railway Journal, January, p. 45.
FAUST (C. A.). — **Trolley bus experiences** imprec dented growth during past year. (3 200 words & fig

1931 621 .33 (.7
Electric Railway Journal, January, p. 49.
1930 sees rapid strides in **railroad electrificatio** (1 600 words & fig.)

Engineer. (London.)

1930 625 .143
Engineer, No. 3909, 12 December, p. 650.
HUDDAERT (A. H.). — **The failure of flat botto steel rails.** (400 words & fig.)

1930 621 .3
Engineer, No. 3909, 12 December, p. 655.
Mercury arc rectifier equipment for the Melbour tramways. (1 400 words & fig.)

1930 62. (01 & 6
Engineer, No. 3910, 19 December, p. 670.
BARKLIE (R. H. D.). — **Effect of metallic coati upon fatigue.** (8 000 words, 3 tables & fig.)

1930 621 .
Engineer, No. 3910, 19 December, p. 674.
Modern **switchgear.** (2 000 words & fig.)

1930 625 .4 (.49
Engineer, No. 3910, 19 December, p. 677; No. 39 26 December, p. 712.
The Chantarella-Corviglia **cable railway** at St. Mori (5 300 words & fig.)

1930 621 .94 (.4
Engineer, No. 3910, 19 December, p. 685.
Superhigh-speed **lathe.** (700 words & fig.)

1930 656 .212.6 (.4
Engineer, No. 3911, 26 December, p. 696.
A ropeway plant at a large oil work. (3 900 wor & fig.)

1930 621
Engineer, No. 3911, 26 December, p. 699.
Cutting pressures and power consumption of « Widia tools. (1 500 words, 2 tables & fig.)

1930 621
Engineer, No. 3911, 26 December, p. 715.
ST. CLAIR (L. J.). — **Cemented tungsten carbide applied to cutting tools.** (1 800 words.)

1930 621 .392 (.4
Engineer, No. 3911, 26 December, p. 716.
Resistance butt welding in shipyards. (1 700 wor & fig.)

1930 62. (01 & 669
The Metallurgist, p. 178, supplement to the Engineer, 26 December.
Limiting creep stresses. (1 800 words.)

1930 669 .1
The Metallurgist, p. 181, supplement to the Engineer, 26 December.
American developments in **nitrogen hardening.** (2 700 words.)

1930 62. (01 & 669
The Metallurgist, p. 183, supplement to the Engineer, 26 December.
Some American researches on the **fatigue of metals.** (2 800 words & fig.)

1930 669 .1
The Metallurgist, p. 186, supplement to the Engineer, 26 December.
Nitrogen in mild steel. (4 000 words.)

1930 625 .143.2 & 625 .143.3
The Metallurgist, p. 189, supplement to the Engineer, 26 December.
Magnetic inspection of rails. (2 400 words & fig.)

1930 669 .1
The Metallurgist, p. 190, supplement to the Engineer, 26 December.
Nitriding developments. (900 words.)

1931 621 .132.1
Engineer, No. 3912, 2 January, p. 18.
Locomotives of 1930. (4 200 words & fig.)

1931 625 .1 (.42)
Engineer, No. 3914, 16 January, p. 68.
Railways in 1930. (5 500 words & fig.)

1931 385 .3 (.42) & 656 (.42)
Engineer, No. 3914, 16 January, p. 70.
Royal Commission on transport. (3 200 words.)

1931 624 .62 (.67)
Engineer, No. 3914, 16 January, p. 74.
LELLAN (Mac P. and W.). — A new Nile **bridge** in Uganda. (700 words & fig.)

1931 656 .281 (.42)
Engineer, No. 3914, 16 January, p. 86.
The Carlisle fatal **railway accident.** (1 000 words & fig.)

Engineering. (London.)

1930 621 .132.5 (.73) & 621 .134.4 (.73)
Engineering, No. 3387, 12 December, p. 737; No. 3389, 26 December, p. 798.
High-pressure compound locomotive for the Delaware and Hudson Railroad. (3 700 words & fig.)

1930 62. (01 & 669
Engineering, No. 3387, 12 December, p. 752.
Brittle fracture of metals. (3 800 words & fig.)

1930 693
Engineering, No. 3387, 12 December, p. 764.
Aggregates. (4 400 words, 3 tables & fig.)

1930 621 .112
Engineering, No. 3387, 12 December, p. 778.
Operating experiences with extra **high-pressure steam.** (3 000 words.)

1930 62. (01
Engineering, No. 3387, 12 December, p. 785.
PULLIN (V. E.). — **X-rays in engineering practice.** (6 600 words & fig.)

1930 621 .116
Engineering, No. 3387, 12 December, p. 788 et p. 821.
EAGLE (A.) and FERGUSON (R. M.). — The coefficients of **heat transfer** from tube to water. (8 000 words, 5 tables & fig.)

1930 625 .4 (.73)
Engineering, No. 3389, 26 December, p. 791.
SKINNER (F. W.). — New York **electric subway construction** methods. — III. (5 500 words & fig.)

1930 669
Engineering, No. 3389, 26 December, p. 794.
Soft solders and soldered joints. (5 000 words & fig.)

1930 625 .13 (.42)
Engineering, No. 3389, 26 December, p. 801.
CALLUM (Mc. R. T.). — The opening-out of Cofton **tunnel.** (900 words.)

1930 621
Engineering, No. 3389, 26 December, p. 807.
The rationalisation of **power generation.** (3 500 words.)

1931 669 .1
Engineering, No. 3390, 2 January, p. 27.
WALLDOW (E.). — The solution of cementite in **carbon steel** and the influence of heterogeneity. (5 600 words & fig.)

1931 625 .214
Engineering, No. 3392, 16 January, p. 76.
The Isothermos axle box. (1 300 words & fig.)

1931 385 .3 (.42) & 656 (.42)
Engineering, No. 3392, 16 January, p. 81.
The control of transport. (2 700 words.)

1931 621 .118 (.42)
Engineering, No. 3392, 16 January, p. 93.
Boiler explosion enquiries. (2 300 words.)

1931 621 .92
Engineering, No. 3392, 16 January, p. 95.
Cylinder-honing machine with hydraulic traverse. (1 400 words.)

Engineering News-Record. (New York.)

1930 625 .1 (.73)
Engineering News-Record, No. 23, December 4, p. 888.
LIVINGSTON (H. T.). — **Building a Rock Island extension** in Texas. (3 500 words, 2 tables & fig.)

1930 725 .33
Engineering News-Record, No. 24, December 11, p. 923.
RASMUSSEN (I. L.). — Design of circular **tank of reinforced concrete.** (2 100 words & fig.)

1930 621 .392
Engineering News-Record, No. 24, December 11, p. 925.
RITTER (J. G.). — Useful structural detail developed for large **all-welded building.** (1 500 words & fig.)

1930 625 .4 (.73)
Engineering News-Record, No. 24, December 11, p. 932.
Structural design of Chicago's subway. (1 400 words & fig.)

1930 691
Engineering News-Record, No. 25, December 18, p. 973.
BACHELDER (W. H.). — **Overheating of aggregates** found detrimental to concrete. (700 words & fig.)

Great Western Railway Magazine. (London.)

1931 385. (08 (.42)
Great Western Ry. Magazine, January, p. 9.
The past year's work in the principal departments. (16 500 words & fig.)

The Institution of Engineers, Australia. (Sydney.)

1928 621 .31 (.944)
Institute of Engineers, Australia (Transactions), vol. IX, p. 24.
CARTER (H. G.). — Barren Jack **hydro-electric development** and its relation to the general power development of the State of New South Wales. (9 900 words & fig.)

1928 621 .132.8 (.944)
Institute of Engineers, Australia (Transactions), vol. IX, p. 63.
HOLLOWAY (R. A.). — **Rail motors** in New South Wales with special reference to the present **standard type of car.** (8 500 words, 1 table & fig.)

1930 621 .392
Institute of Engineers, Australia, November, p. 426.
BALDWIN (D. E.). — **Electrically-welded** oil tanks. (3 800 words & fig.)

1930 621 .331 (.945)
Institute of Engineers, Australia, November, p. 431.
WILSHIRE (J. R.). — **Some features of design, and operating experiences of 1 500-v. railway sub-stations.** (4 200 words & fig.)

1930 62. (01 & 621 .392
Institute of Engineers, Australia, November, p. 434.
MOON (A. R.). — Control of quality in **electrically welded steel structures.** (2 000 words.)

Journal of the Institute of Transport. (London.)

1931 656 .257
Journal of the Institute of Transport, January, p. 139.
PARSONS (J.). — **Remote control of switches and signals.** (4 100 words.)

1931 385 .21
Journal of the Institute of Transport, January, p. 144.
CADBURY (G.). — The function of **canal transport** to-day. (6 700 words.)

Locomotive, Railway Carriage & Wagon Review. (London.)

1931 621 .132.5 (.469)
Loc. Ry. Carriage & Wagon Review, January 15, p. 1.
Eight-coupled compound locomotive, Beira-Alta Railway. (1 500 words & fig.)

1931 625 .232 (.44)
Loc. Ry. Carriage & Wagon Review, January 15, p. 5.
Novel **suburban steel train,** Northern Railway of France. (600 words.)

1931 621 .132.3 (.43)
Loc. Ry. Carriage & Wagon Review, January 15, p. 7.
Standard locomotives of the German Railways. (4 000 words & fig.)

1931 621 .133.4 (.52) & 621 .133.6 (.52)
Loc. Ry. Carriage & Wagon Review, January 15, p. 12.
Duplex locomotive chimney, Imperial Railways of Japan. (200 words & fig.)

1931 621 .132.3
Loc. Ry. Carriage & Wagon Review, January 15, p. 13.
JACQUET (A.). — **Proposed express locomotive** for heavy continental trains. (1 000 words.)

1931 621 .131.2
Loc. Ry. Carriage & Wagon Review, January 15, p. 14.
PHILLIPSON (E. A.). — **Steam locomotive design : data and formulae.** (To be continued.) (1 800 words & fig.)

1931 625 .252
Loc. Ry. Carriage & Wagon Review, January 15, p. 25.
New automatic slack adjuster for continuous brakes. (400 words & fig.)

1931 621 .39
Loc. Ry. Carriage & Wagon Review, January 15, p. 30.
Electric rivet heating. (400 words & fig.)

1931 621 .134.2
Loc. Ry. Carriage & Wagon Review, January 15, p. 30.
Valve-setting for three-cylinder engines fitted with Walschaerts-Gresley gear. (1 100 words & fig.)

Mechanical Engineering. (New York.)

1930 621 .89
Mechanical Engineering, December, p. 1059.
THOMPSON (E. H.). — **Crane lubrication.** (5 600 words & fig.)

1930 62. (01 & 621 .392
Mechanical Engineering, December, p. 1063.
COX (O. L.). — Destruction test of an **electrically welded superheater drum.** (800 words & fig.)

1931 621 .8 & 656 .212.8
Mechanical Engineering, January, p. 7.
Progress in materials handling. (3 300 words.)

1931 621 .116
Mechanical Engineering, January, p. 15.
Progress in fuel utilization in 1930. (9 500 words.)

1931 621 .85
Mechanical Engineering, January, p. 21.
Progress in machine-shop practice. (2 000 words.)

1931 621 .4
Mechanical Engineering, January, p. 29.
Progress in oil- and gas- power engineering. (10 200 words & fig.)

1931 621 .13 & 625 .3
Mechanical Engineering, January, p. 38.
Progress in railroad mechanical engineering. (4 500 words & fig.)

1931 621 .18
Mechanical Engineering, January, p. 41.
Progress in steam-power engineering. (3 700 words.)

1931 669 .1
Mechanical Engineering, January, p. 48.
Progress in the iron and steel industry in 1930 (4 500 words.)

Modern Transport. (London.)

1930 656 .255 (.41)
Modern Transport, No. 613, 13 December, p. 3.
Conversion of double line into single track. (4 000 words & fig.)

1930 621 .335 & 621 .4
Modern Transport, No. 613, 13 December, p. 7.
The oil-electric engine and the railways. — An economic alternative to electrification. (2 100 words & fig.)

1930 625 .214
Modern Transport, No. 613, 13 December, p. 11.
Improved axle-boxes. — The « Isothermos » system. (1 000 words & fig.)

1930 621 .33
Modern Transport, No. 614, 20 December, p. 2.
Railway electrification. (1 300 words.)

1930 621 .335 (.82) & 621 .338 (.82)
Modern Transport, No. 614, 20 December, p. 3.
British-built **rolling stock** for the Argentine. — **Motor coaches** for Buenos Aires Terminal Central Railway. (2 800 words & fig.)

1930 625 .172 (.42) & 621 .392 (.42)
Modern Transport, No. 614, 20 December, p. 5.
QUATERMAINE (A. S.). — **New methods on the permanent way.** (700 words & fig.)

1930 656 .25
Modern Transport, No. 614, 20 December, p. 7.
TATTERSALL (A. E.). — **Railway signalling.** — The trend of development. (2 400 words & fig.)

1930 621 .133
Modern Transport, No. 614, 20 December, p. 10.
Steam condensing on locomotives. — Advantages and difficulties. (900 words.)

1930 621 .335 & 621 .4
Modern Transport, No. 614, 20 December, p. 11.
The oil-electric engine and the railways. — Discussion at Institute of Transport. (2 800 words.)

1930 621 .338 (.42)
Modern Transport, No. 615, 27 December, p. 3.
Electrification of Manchester, South Junction and Altrincham Railway. (1 700 words & fig.)

1930 656 .237
Modern Transport, No. 615, 27 December, p. 4.
Duties of a railway accountant. — Meeting new problems. (1 000 words.)

1930 621 .338 (.42)
Modern Transport, No. 615, 27 December, p. 5.
New tube rolling stock. — London Underground experimental cars. (1 100 words.)

1930 385
Modern Transport, No. 615, 27 December, p. 6.
International trade and railways. — Economic factors of recent years. (800 words.)

1930 625 .246 (.43)
Modern Transport, No. 615, 27 December, p. 8.
Heavy loads by road or rail. — **New type of trailer.** (700 words & fig.)

1930 659 (.42)
Modern Transport, No. 615, 27 December, p. 9.
New **canvassing methods** on the Southern Railway. (1 600 words & fig.)

1931 625 .4 (.42)
Modern Transport, No. 616, 3 January, p. 3.
THOMAS (J. P.). — **London Underground Railway developments.** (3 500 words & fig.)

1931 621 .132.8 (.43) & 621 .43 (.43)
Modern Transport, No. 616, 3 January, p. 5.
New German **Diesel-electric rail car.** (2 100 words & fig.)

1931 347 .763.4 (.42)
Modern Transport, No. 616, 3 January, p. 9.
Conditions affecting **carriage by rail.** (1 600 words.)

1931 385. (09.1 (.51)
Modern Transport, No. 616, 3 January, p. 10.
Railways in China. — **Chaotic condition.** (1 000 words.)

1931 656 .213 (.42)
Modern Transport, No. 617, 10 January, p. 3.
Southern Railway improvements at Dover. (1 200 words & fig.)

1931 385 .3 (.42) & 656 (.42)
Modern Transport, No. 617, 10 January, p. 5.
Co-ordination and development of transport. (7 000 words.)

1931 388 (.42)
Modern Transport, No. 617, 10 January, p. 11.
The London **passenger transport** scheme. (1 400 words & fig.)

1931 621 .132.1 (.42)
Modern Transport, No. 617, 10 January, p. 14.
British **locomotives** for overseas. Representative types of 1930. (Figures.)

1931 38
Modern Transport, No. 618, 17 January, p. 3.
CLEMINSON (H. M.). — **Shipping and other forms of transport.** (To be continued.) (2 300 words.)

1931 656 .257 (.54)
Modern Transport, No. 618, 17 January, p. 9.
BAKER (E. W.). — **Double-wire system of point operation.** (1 600 words & fig.)

Proceedings, American Society of Civil Engineers (New York.)

1930 624 .0 (.73
Proceed. Amer. Soc. Civil Eng., December, p. 2161.
HOVEY (O. E.) and SEAMAN (H. B.). — Genera specifications for **steel railway bridges.** — Discussio (continued). (800 words.)

1930 385 .21 (.73
Proceed. Amer. Soc. Civil Eng., December, p. 2173.
HOBBS (H. W.). — Relation between **rail and wate way transportation : A symposium.** — Discussion (co tinued). (1 600 words.)

1930 656 .1 (.73
Proceed. Amer. Soc. Civil Eng., December, p. 2187.
JOHANNESSON (S.), KRYNINE (D. P.), LEWI (H. M.) and BAKER (D. M.). — **Highways as element of transportation.** — Discussion (continued). (3 8 words & fig.)

Proceedings, Institution of Mechanical Engineers (London.)

1930 621 .18 (.42) & 621 .31 (.42
Proceed. Inst. of Mechanical Engineers, May, p. 603.
GUY (H. L.) and LAMB (H. C.). — **Operating resul** with the recent extensions at Barton **Power Statio** (21 500 words, 13 tables & fig.)

1930 62. (01 & 621
Proceed. Inst. of Mechanical Engineers, May, p. 681.
HERBERT (E. G.). — Cutting tools Research Co mittee. — Report on hot-hardness characteristics some modern **tool steels and alloys.** (3 100 words fig.)

1930 62. (01 & 621
Proceed. Inst. of Mechanical Engineers, May, p. 693.
COKER (E. G.) and Miss LEVI (R.). — Conta pressures and stress distributions in **cams, rollers a wheels.** (10 000 words, 1 table & fig.)

1930 62. (01 & 6
Proceed. Inst. of Mechanical Engineers, May, p. 731.
BARKLIE (R. H. D.) and DAVIES (H. J.). — T effect of surface conditions and electro-deposited meta on the **resistance of materials to repeated stress** (6 300 words, 3 tables & fig.)

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1930 385 .1 (.7
Railway Age, No. 22, November 29, p. 1162.
LEE (E.). — The railways are going to fight! (3 0 words & fig.)

1930 656 .212.6 (.73) & 656 .213 (.7
Railway Age, No. 22, November 29, p. 1165.
New York Central builds modern **coal-dumping plan** (3 600 words & fig.)

1930 625 .233 (.73)
Railway Age, No. 22, November 29, p. 1170.
Central energy system for trains. (1 300 words & fig.)

1930 651 (.73)
Railway Age, No. 22, November 29, p. 1173.
WHALEY (W. R. F.). — Pennsylvania opens modern stationery store. (3 500 words & fig.)

1930 621 .135.2 (.73)
Railway Age, No. 22, November 29, p. 1177.
BUCKWALTER (T. V.). — **Operating results with the Timken locomotive.** (7 200 words & fig.)

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Railway Age, No. 22, November 29, p. 1183.
Toledo terminal installs **simplified interlocking system for swing bridge.** (2 100 words & fig.)

1930 625 .151 & 625 .154
Railway Age, No. 22, November 29, p. 1188.
Turntables used in new type railway crossing. (400 words & fig.)

1930 625 .232 (.73)
Railway Age, No. 23, December 6, p. 1210.
Chesapeake & Ohio imperial **salon cars.** (1 700 words & fig.)

1930 625 .1 (.73) & 625 .162 (.73)
Railway Age, No. 23, December 6, p. 1214.
Eliminate 29 busy grade crossings. (6 200 words & fig.)

1930 385 .3 (08 (.73)
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Interstate Commerce Commission annual report. (6 500 words.)

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Railway Age, No. 23, December 6, p. 1227.
JACKSON (H. E.). — **The railroad pension problem.** (8 000 words.)

1930 621 .116
Railway Age, No. 24, December 13, p. 1258.
BECK (C. V.). — **The piped fuel bugaboo.** (7 200 words & 2 tables.)

1930 621 .132.7 (.73) & 621 .335 (.73)
Railway Age, No. 24, December 13, p. 1265.
Milwaukee tests Whitcomb **oil-electric switchers.** (2 100 words & fig.)

1930 656 .212 (.73) & 725 .32 (.73)
Railway Age, No. 24, December 13, p. 1268.
New terminal speeds fruit movement from coast. (4 300 words & fig.)

1930 656 .212.7 (.73)
Railway Age. No. 25, December 20, p. 1306.
A « close-Up » of **perishables handling.** (3 600 words & fig.)

1930 656 .257 (.73)
Railway Age, No. 25, December 20, p. 1310.
Electric interlocking speeds traffic on 4.5-mile section of the Pittsburgh & Lake Erie. (2 300 words, 2 tables & fig.)

1930 621 .133.7 (.73)
Railway Age, No. 25, December 20, p. 1321.
Water conditioner shows savings on the Milwaukee. (2 100 words & fig.)

1930 385 .3 (.73) & 621 .13 (.73)
Railway Age, No. 25, December 20, p. 1329.
Annual report of Bureau of Locomotive Inspection. (1 000 words & fig.)

1930 625 .1 (.73)
Railway Age, No. 26, December 27, Section I, p. 1354.
Noteworthy **double-track program** brought to a close. (5 000 words & fig.)

1930 621 .132.5 (.73)
Railway Age, No. 26, December 27, Section I, p. 1363.
Cotton Belt replaces **Consolidation type motive power.** (2 200 words & fig.)

1930 625 .32 (.73)
Railway Age, No. 26, December 27, Section I, p. 1366.
Sun-parlor lounge cars for the Delaware, Lackawanna & Western. (400 words & fig.)

1930 656 (.73)
Railway Age, No. 26, December 27, Section I, p. 1367.
SHOUP (P.). — Railroads form basic unit of country's transportation. (4 600 words & fig.)

1930 625 .242 (.73)
Railway Age, No. 26, December 27, Section I, p. 1371.
Pennsylvania builds **65-ft. gondola cars.** (400 words & fig.)

1930 385 .3 (.73) & 656 (.73)
Railway Age, No. 26, December 27, Section II, p. 1393.
Motor transport hearings begin. — Interstate Commerce Commission concludes first half of series of sessions investigating **railway and motor transport co-ordination.** (8 500 words.)

1930 656 .1 & 656 .261
Railway Age, No. 26, December 27, Section II, p. 1404.
YOUNG (L. B.). — **Why use motor trucks?** (2 500 words & fig.)

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Railway Age, No. 26, December 27, Section II, p. 1409.
Summarize highway operations of class I railroads. (600 words & 3 tables.)

1930 347 .763 (.42) & 656 .1 (.42)
Railway Age, No. 26, December 27, Section II, p. 1411.
ARTHURTON (A. W.). — **The British highway traffic Act.** (5 600 words.)

Railway Engineer. (London.)

1931 **656 .255 (.41)**
Railway Engineer, January, pp. 2 and 11.
The conversion of double lines into single tracks. (3 500 words.)

1931 **621 .134.3**
Railway Engineer, January, p. 2.
Poppet valves for locomotives. (1 600 words.)

1931 **621 .134.3**
Railway Engineer, January, p. 3.
High-pressure locomotive boilers. (1 800 words.)

1931 **621 .132.3 (.82) & 621 .134.3 (.82)**
Railway Engineer, January, p. 7.
New **three-cylinder 4-6-2 locomotives,** Central Argentine Railway. (1 800 words & fig.)

1931 **385 .586 & 621 .134.2**
Railway Engineer, January, p. 9.
ARD (Mc. G. W.). — **A valve gear** model for locomotive drawing offices. (800 words & fig.)

1931 **656 .253 (.42)**
Railway Engineer, January, p. 13.
The **Automatic Train Control** Committee's report. (3 000 words.)

1931 **656 .211 (.42) & 725 .31 (.42)**
Railway Engineer, January, p. 15.
Partial **reconstruction of Ely station,** London & North Eastern Railway. (1 700 words & fig.)

1931 **621 .132.5 (.73) & 621 .134.3 (.73)**
Railway Engineer, January, p. 21.
POULTNEY (E. C.). — The « James Archbald » **high-pressure locomotive.** (5 400 words & fig.)

1931 **625 .22**
Railway Engineer, January, p. 27.
The motion of railway vehicles on a curved line. — IV. (To be continued.) (4 500 words & fig.)

1931 **621 .132.7 (.82) & 621 .43 (.82)**
Railway Engineer, January, p. 31.
Diesel shunting locomotive, Central Argentine Railway. (1 900 words & fig.)

1931 **62. (01**
Railway Engineer, January, p. 33.
A new hardness testing machine. (900 words & fig.)

1931 **621 .132.8 & 621 .43**
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GEIGER (J.). — **Diesel locomotive design.** — III. The practical advantages of Diesel locomotives. (4 500 words.)

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COPPOCK (C.). — **Electric train-lighting equipment.** — XIV. (4 700 words & fig.)

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1930 **625 .144.4 & 625 .17**
Railway Engineering and Maintenance, Dec., p. 538.
Tractors show flexibility in maintenance work. (3 200 words & fig.)

1930 **693**
Railway Engineering and Maintenance, Dec., p. 542.
Masonry failures. Their causes and remedies. (3 500 words & fig.)

1930 **625 .175**
Railway Engineering and Maintenance, Dec., p. 546.
KNOWLES (C. R.). — **Operating motor cars safely.** Part III. (4 000 words & fig.)

1930 **621 .133.7 (.73)**
Railway Engineering and Maintenance, Dec., p. 550.
The **hot process water treatment.** (1 000 words & fig.)

1930 **625 .43.4 & 665 .882**
Railway Engineering and Maintenance, Dec., p. 552.
RYAN (L. C.). — **Lengthening rails by butt welding.** (1 500 words & fig.)

1930 **625 .143.2**
Railway Engineering and Maintenance, Dec., p. 555.
Flaw detector at rail-sawing plant. (2 800 words & fig.)

1930 **621 .87 & 656 .212.6**
Railway Engineering and Maintenance, Dec., p. 558.
Many uses for **truck-crane** at City Terminal. (2 100 words & fig.)

Railway Gazette. (London.)

1930 **656 .255 (.41)**
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The singling of double lines of railway, Great Southern Railways of Ireland. — II and III. (4 700 words & fig.)

1930 **625 .243 (.42)**
Railway Gazette, No. 24, 12 December, p. 786.
12-ton ventilated covered goods vans, London Midland & Scottish Railway. (500 words & fig.)

1930 **625 .232 (.42)**
Railway Gazette, No. 25, 19 December, p. 813.
New **Pullman parlour-car** service, Southern Railways. (900 words & fig.)

1930 **656 .1 (.42)**
Railway Gazette, No. 25, 19 December, p. 820.
The East Kent Road Car Co. Ltd. (1 900 words & fig.)

1930 625 .1 (.81)
Railway Gazette, No. 26, 26 December, p. 850.
The Caratinga extension of the Leopoldina Railway, Brazil. (1 000 words & fig.)

1930 621 .132.3 (.469)
Railway Gazette, No. 26, 26 December, p. 852.
New **four-cylinder express locomotives** for Portugal. (400 words & fig.)

1930 656 .212.6
Railway Gazette, No. 26, 26 December, p. 853.
A new **petrol-driven truck.** (500 words & fig.)

1931 625 .4 (.42)
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London Underground traffic and the new extensions. (1 300 words & fig.)

1931 621 .338 (.82)
Railway Gazette, No. 1, 2 January, p. 13.
New **electric rolling-stock** for Buenos Aires subway. (2 000 words & fig.)

1931 621 .132.3 (.43)
Railway Gazette, No. 1, 2 January, p. 17.
New **4-6-2 type express locomotives** for the German Railways. (600 words & fig.)

1931 621 .331
Railway Gazette, No. 1, 2 January, p. 19.
Midworth **distant repeater equipment** for electric sub-station control. (1 300 words & fig.)

1931 624 .32 (.54)
Railway Gazette, No. 2, 9 January, p. 44.
The **Bally bridge** and the Calcutta Chord Railway. (2 200 words & fig.)

1931 621 .87
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Recent developments in **mobile petrol-electric cranes.** — A description of the new « Super-mobile » type of crane. (1 900 words & fig.)

1931 621 .132.5 (.497.2)
Railway Gazette, No. 2, 9 January, p. 52.
New **standard locomotives** for the Bulgarian State Railways. (600 words & fig.)

1931 625 .235 (.42)
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A railway **sleeping car innovation.** (400 words & fig.)

1931 385 .3 (.42) & 656 (.42)
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The report of the Royal Commission on Transport. (2 400 words.)

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Railway Gazette, No. 3, 16 January, p. 74.
Double-headed rails and cast-iron sleepers. (600 words.)

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Transport co-ordination and development. (5 600 words.)

1931 656 .1 (.42)
Railway Gazette, No. 3, 16 January, p. 85.
Southdown **motor services.** (3 900 words & fig.)

1931 656 .261 (.42)
Railway Gazette, No. 3, 16 January, p. 93.
Van tractors on the London & North Eastern Railway. (600 words & fig.)

Railway Magazine. (London.)

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Railway Magazine, January, p. 15.
ALLEN (C. J.). — **British locomotive practice and performance.** (3 200 words & fig.)

Railway Mechanical Engineer. (New York.)

1930 621 .532.7 (.73) & 621 .335 .73)
Railway Mechanical Engineer, December, p. 675.
Whitcomb **oil-electric switchers** on the Milwaukee. (2 700 words & fig.)

1930 621 .138.1 (.73) & 721 .33 (.73)
Railway Mechanical Engineer, December, p. 677.
Grand Trunk Western builds **enginehouse** at Pontiac. (4 500 words & fig.)

1930 625 .242 (.73)
Railway Mechanical Engineer, December, p. 683.
New Jersey Central buys 200 **65-ft. gondolas.** (1 700 words & fig.)

1930 621 .138
Railway Mechanical Engineer, December, p. 686.
ACKER (S. H.). — Air consumption of **sand hoists.** (3 200 words & fig.)

1930 621 .132.5 (.71)
Railway Mechanical Engineer, December, p. 693.
Five **4-6-4 type locomotives** for the Canadian National. (2 100 words, 1 table & fig.)

1930 625 .234 (.73)
Railway Mechanical Engineer, December, p. 696.
First **air-conditioned car** in the West. (2 800 words & fig.)

Railway Signaling. (Chicago.)

1930 656 .257 (.73)
Railway Signaling, December, p. 429.
DAVIS (R. L.). — **Remotely-controlled interlocking** reduces operating costs. (1 400 words & fig.)

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Railway Signaling, January, p. 1.
Signaling construction during 1930. (2 800 words & 16 tables.)

1931 621 .39 (.73) & 625 .258 (.73)
Railway Signaling, January, p. 11.
FOLLETT (W. F.). — **New Haven develops unique power supply for retarders at Providence Yard.** (1 400 words & fig.)

1931 656 .257 (.73)
Railway Signaling, January, p. 13.
WYANT (L.). — **Another unique interlocker on the Rock Island.** (1 500 words & fig.)

1931 656 .255 (.73) & 656 .258 (.73)
Railway Signaling, January, p. 15.
NOBLE (S. E.). — **Three-track signaling on 13.5 miles of the Chicago & North Western.** (6 300 words & fig.)

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Railway Signaling, January, p. 21.
Annual report of Bureau of Safety on signals and train control. (3 700 words.)

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TAYLOR (E. S.). — **Canadian Pacific utilizes modern interlocking to protect movable bridges.** (600 words & fig.)

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1930 621 .138.1
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The ideal layout for a locomotive depot. (1 300 words & fig.)

In Spanish.

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Ingenieria y Construcción, diciembre, p. 658.
GIBERT (A.) y SALINAS. — **El refuerzo del gancho de tracción y el establecimiento del frenado continuo en los trenes de mercancias.** (3 400 palabras.)

1931 624 .63 (.460)
Ingenieria y Construcción, enero, p. 1.
MARTINEZ DE VELASCO (R.). — **Observaciones prácticas en la construcción de un viaducto.** (2 500 palabras & fig.)

Revista de Obras Públicas. (Madrid.)

1930 625 .3 (.82 + .83)
Revista de Obras Publicas, n° 24, 15 de diciembre, p. 550.
AGUILAR (M.). — **El ferrocarril Trasandino.** (1 200 palabras & fig.)

1931 624 .63
Revista de Obras Publicas, n° 1, 1° de enero, p. 1.
RIBERA (J. E.). — **Puentes de hormigón armado, con una sola articulación.** (2 600 palabras & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1930 624 .2
Annali dei lavori pubblici, novembre, p. 997.
HANNAU (V.). — **Alcune considerazioni sull' impiego delle travate continue per ferrovia.** (7 000 parole, 9 quadri & fig.)

Notiziario tecnico. (Firenze.)

1931 621 .138.3
Notiziario tecnico, gennaio, p. 12.
La riparazione accelerata delle locomotive. (4 500 parole & fig.)

Rivista delle communicazioni ferroviarie. (Roma.)

1931 385 .113 (.45)
Riv. delle communic. ferrov., 1° gennaio, p. 15.
L'andamento delle ferrovie dello Stato nell'anno finanziario 1929-1930. (2 200 parole.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1930 625 .5 (.45)
Riv. tecnica delle ferrovie italiane, n° 5, 15 nov., p. 221.
FERRETTI (P.). — **La funivia di Montecassino.** (2 500 parole & fig.)

1930 625 .13 (.52), 625 .2 (.52) & 656 .2 (.52)
Riv. tecnica delle ferrovie italiane, n° 5, 15 nov., p. 254.
CORBELLINI (G.). — **Appunti su caratteristiche del materiale e su qualche criterio di esercizio delle ferrovie imperiali giapponesi.** (4 000 parole, 6 tabelle et fig.)

1930 621 .138.1 (.45) & 725 .33 (.45)
Riv. tecnica delle ferrovie italiane, n° 6, 15 dic., p. 285.
ROMERO (R.) e CARLI (C.). — **Il nuovo deposito per locomotive a vapore ed elettriche di Bologna.** (9 200 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1930 **621 .335**

De Ingenieur, N^r 51, 19 December, blz. 49.

SACHS (K.). — **Elektrifizierung von Vollbahnen** unter besonderer Berücksichtigung bemerkenswerter Neuerungen auf dem Gebiete der elektrischen Lokomotiven. (1 000 woorden & fig.)

Spoor- en Tramwegen. (Utrecht.)

1930 **625 .13 (.492)**

Spoor- en Tramwegen, N^r 13, 23 December, blz. 339.

JANSE (J.). — **Omhoog brengen van de Maasspoorbrug** en verruimen van het viaduct over den Rijksweg Nijmegen-Maastricht, nabij Mook. (Slot volgt.) (1 300 woorden & fig.)

1930 **651 (.492)**

Spoor- en Tramwegen, N^r 13, 23 December, blz. 344.

HANLO (A. E. M. J.). — **Het ponskaartensysteem** in de administratie der nederlandsche spoorwegen. (1 700 woorden & fig.)

1931 **656 .1 (.494) & 656 .2 (.494)**

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SIMON-THOMAS (W.). — **Bundesbahnen und Automobil.** (1 900 woorden & fig.)

In Polish.

INŻYNIER KOLEJOWY. (Warszawa).

1931 **621 .392 & 624**

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KATZ (O.). — Spawanie tukiem elektrycznym, a mostownictwo. (5 400 slowa & rys.)

1931 **625 .259**

Inzynier Kolejowy, 1 Stycznia, str. 18.

ROSIKOŃ (A.). — Z Dziedziny wynalazkow. Klin do podtrzymywania wagonów kolejowych stojacych na spadku. (1 300 slowa & rys.)

In Portuguese.

Boletim do Instituto de Engenharia. (S. Paulo.)

1930 **624 .2 (01**

Boletim do Instituto de Engenharia, Out.-Nov., p. 157.

DOS SANTOS REIS (F.). — **Os erros dos theoremas de Castigliano em systemas isostaticos e hyperestaticos. As causas e as condições de applicabilidade desses theoremas até hoje desconhecidas.** (Continuação.) (3 700 palavras & fig.)

1930 **624 .2**

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FARIA DE OLIVEIRA (O.). — **Estudo de trem typo para a E. F. Sorocabana.** (6 300 palavras & fig.)

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MONTHLY BIBLIOGRAPHY OF RAILWAYS [1].

PUBLISHED UNDER THE SUPERVISION OF

P. GHILAIN,

General secretary of the Permanent Commission of the International Railway Congress Association.

(**MAY 1931**)

[016 .385 (02]

I. — BOOKS.

In French.

1931 691

AURIAC (P. A. d').

Leçons de sidérurgie professées à l'Ecole des Mines de Saint-Etienne.

Paris (6e), Dunod, 92, rue Bonaparte. Un volume (16 × 25 cm.), 716 pages, 231 figures. (Prix : 120 francs.)

1931 691

CHAMPLY (R.).

Béton armé, enduits et agglomérés.

Paris, Desforges, Girardot & Cie. Un volume, 316 pages et 90 figures. (Prix : 35 francs.)

1931 621 .116

DE BIE (Ch.).

Les chaudières à vapeur.

Paris (6e), Dunod, 92, rue Bonaparte. Un volume (16 × 25 cm.), 600 pages, 491 figures, 90 tableaux. (Prix : 165 francs.)

1931 621 .43

LE GALLOU (Y.).

Théorie succincte, description, conduite et entretien du moteur Diesel.

Paris (6e), Dunod, 92, rue Bonaparte. Un volume (19 × 28 cm.), 362 pages, 208 figures. (Prix : 80 francs.)

1930 62. (09

LE GÉNIE CIVIL. — Numéro spécial publié à l'occasion du cinquantenaire de la fondation du « Génie Civil » (1880-1930).

L'évolution et le développement des principales industries depuis cinquante ans.

Paris (9e), **Génie Civil**, 5, rue Jules Lefèbvre. Un volume de 230 pages & figures. (Prix : 25 francs.)

1931 31. (02

MARCH (L.).

Les principes de la méthode statistique.

Paris (6e), Félix Alcan, 108, boulevard Saint-Germain. Un volume in-8e, 808 pages. (Prix : 125 francs.)

1931 531. (02

NICAISE (M.).

Les mouvements mécaniques. — Etude descriptive et raisonnée des mécanismes.

Paris (6e), Béranger, 15, rue des Saints-Pères. Un volume (16 × 25 cm.), 694 pages, 1 031 figures & tableaux. (Prix : 200 francs.)

1931 385. (09 (.44)

PARDÉ (M.).

Les chemins de fer français depuis 1927.

Paris (6e), Gauthier-Villars & Cie, 55, quai des Grands-Augustins. Un volume (16 × 25 cm.), 70 pages. (Prix : 10 francs.)

1931 351. (02

RICARD (J. D.).

Droit et jurisprudence en matière de postes, télégraphes, téléphones. — Tome premier (Le service public, l'administration et le personnel des P. T. T.).

Paris (5e), Librairie du recueil Sirey, 22, rue Soufflot. (Prix : 90 francs.)

1931 62. (01 & 669

ROUDIÉ (P.).

Le contrôle de la dureté des métaux dans l'industrie.

Paris, Dunod, rue Bonaparte, 92. Un volume (16 × 25 cm.), 114 pages, 6 figures. (Prix : 35 francs.)

1931 385. (09 (.6)

WIENER (L.).

Les chemins de fer coloniaux de l'Afrique.

Paris (6e), Dunod, 92, rue Bonaparte. Un volume (13 × 25 cm.), 574 pages, 31 figures. (Prix : 75 francs.)

[1] The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress conjointly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to Railway Science », by L. Weissenbruch in the number for November, 1897, of the *Bulletin of the International Railway Congress*, p. 1509).

In German.

1931 621 .134
BARSKE (U.).
Rechnerische Untersuchung der Wärmeübertragung im Lokomotiv-Langkessel.
Hannover-Linden, Hanomag-Nachrichten-Verlag G. m. b. H. Ein Heft mit 81 Seiten, 45 Diagrammen und 5 Rechentafeln. (Preis : 3 Rm.)

1931 624. (02
GEHLER (W.).
Balkenbrücken.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, rue des Paroissiens, 54. (Preis : 6.80 Rm.)

1930 621 .335. (02
GRÜNHOLZ (H.).
Elektrische Vollbahnlokomotiven.
Berlin, Druckerei und Verlagsanstalt Norden G. m. b. H. Ein Band von 360 Seiten mit Lokomotiv-Tabellen und -Tafeln.

1931 624 .2
KLEINLOGEL (A.).
Belastungsglieder.
Berlin, W. 8, Verlag von Wilhelm Ernst & Sohn. Ein Band, 117 Seiten mit zahlreichen Abbildungen. (Preis : 7.80 Rm.)

1931 721 .9
KMENTT (H.).
Eisenbeton-Tabellen.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, rue des Paroissiens, 54. Ein Band von 167 Seiten und 4 Schaulinientafeln. (Preis : 12 Rm.)

1931 621 .392
KRÖKEL (H.).
Die elektrischen Schweissverfahren.
Berlin & Leipzig, Walter de Gruyter & Co. Ein Band, 136 Seiten mit 66 Abbildungen. (Preis : 1.80 Rm.)

1931 62. (01 & 669 .1
REIN (W.).
Versuche zur Ermittlung der Knickspannungen für verschiedene Baustähle.
Leipzig, Johann Ambrosius Barth & Brüssel, Falk, Fils, rue des Paroissiens, 54. Ein Band mit 55 Seiten und 42 Textabbildungen. (Preis : 6 Rm.)

1931 621. (02
ten BOSCH (M.).
Vorlesungen über Maschinenelemente. — Heft 5, **Elemente der Kolbenmaschinen.**
Leipzig, Johann Ambrosius Barth und Brüssel, Falk, Fils, rue des Paroissiens, 54. Ein Heft von 86 Seiten mit 153 Textabbildungen. (Preis : 7 Rm.)

1931 385. (09 (.43)
Vor 10 Jahren. — Erinnerungen an die Verreichlichung der Deutschen Staatseisenbahnen und kritische Betrachtungen. Herausgegeben von Staatssekretär a. D. Dr. h. c. Stieler.
Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m. b. H. bei der Deutschen Reichsbahn. Ein Heft, 119 Seiten. (Preis : 3 Rm.)

1931 385 .6 (.43)
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Die Deutsche Reichsbahn und ihre Beziehungen zu ausländischen Eisenbahnen.
Berlin, Verkehrswissenschaftliche Lehrmittelgesellschaft m. b. H. bei der Deutschen Reichsbahn. Ein Band, 152 Seiten.

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1931 385. (08 (.73)
ALASKA RAILROAD. — Report of special select committee on investigation of the Alaska Railroad.
Washington, D. C., United States Government Printing Office. 36 pages.

1931 62. (01 (.73) & 691 (.73)
AMERICAN SOCIETY FOR TESTING MATERIALS STANDARDS.
Philadelphia, American Society for testing materials, Spruce street, 1315. Two volumes (6 × 9 inches), 1 000 and 1 214 pages. (Price : $ 7.50 each.)

1931 621 .39
BARNARD (G. P.).
The selenium cell : its properties and applications.
London; Constable & Co. Ltd. One volume (6 1/4 × 10 inches), 331 pages. (Price : 35 sh. net.)

1931 38 & 656
BUDD (R.).
The changing transportation situation.
Washington (D. C.), U. S. Government Printing Office. One volume, 172 pages. (Price : 30 cents.)

1931 656 .253 (.73)
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1931 621 .13 (09

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1931 624 .62 (.43)

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1931 621 .43

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1931 621 .116

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1931 625 .144.4 (.44)

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1931 627 (.599)

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1931 531

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1931 625 .5 (.45) & 625 .62 (.45)

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HUNZIKER (F.). — **Funiculaire** pour le remorquage des tramways sur une rampe de la ligne de Trieste à Opcina. (3 300 mots & fig.)

1931 656 .25 (.44)

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La transformation de la **signalisation** des grands réseaux de chemins de fer français. (1 600 mots & fig.)

1931 621 .116

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1931 656 .211 (.44)

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1931 **669**

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1931 **385. (09 (.64)**

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1931 **385 (.43)**

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Les **chemins de fer français** et le développement industriel du pays. — Les Chemins de fer de l'Etat. (2 700 mots & fig.)

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1930 **621 .335 (.436)**

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1930 **621 .335**

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HUG (A. M.). — Un nouveau type d'**automotrices articulées** pour services de banlieue et pour tramways. (1 000 mots & fig.)

1930 **621 .33**

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SPINEDY (E. S.). — Calcul des systèmes de distribution sur les **réseaux électriques** de chemins de fer électriques. (5 900 mots & fig.)

1930 **621 .33**

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1931 **621 .33 (.460)**

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1931 **621 .337**

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1931 **621 .133.3**

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1931 **625 .1 (.44)**

Les chemins de fer et les tramways, février, p. 28.

Les travaux de la ligne de Sceaux. (4 000 mots.)

1931 **625 .212**

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Roues libres avec boîtes à rouleaux anti-friction. (1 200 mots.)

1931 **625 .258**

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Sabot-frein à commande électro-mécanique. (1 900 mots & fig.)

1931 **625 .162**

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Commande automatique des barrières de passages à niveau. (1 000 mots & fig.)

1931 **625 .216**

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1930 **669**

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1931 **621 .335 (.44)**

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BERGERET. — Les **locomotives électriques** pour trains de marchandises de la Compagnie Paris-Lyon-Méditerranée. (24 000 mots, 5 tableaux & fig.)

1931 **621 .13 (06 (.493), 621 .335 (06 (.493) & 625 .2 (06 (.493)**

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LASSON. — Le **matériel de chemin de fer** à l'Exposition internationale de Liége 1930. (14 500 mots, 3 tableaux & fig.)

1931 **656 .213**

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GODFERNAUX (R.). — Les **embranchements industriels** et leur utilité. (21 000 mots & fig.)

1931 **385. (09.1 (.438)**

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Le développement des chemins de fer polonais et de leur trafic depuis la guerre. (4 800 mots & fig.)

1931 **656 .211 (.44)**

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Projet de convention relative au **remaniement des gares de Paris du réseau de l'Etat.** (1 700 mots & fig.)

1931 **625 .162 (.44)**

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Le problème des **passages à niveau** en France. (1 200 mots.)

1931 **625 .617**

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Truck transbordeur pour le transport sur voie d'un mètre, de wagons de voie normale. (100 mots & fig.)

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1931 **385 .5 (.44)**

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PRESSAC (P. de). — Les **fonctionnaires**, le budget et les retraites. (2 500 mots.)

1931 **385. (09 (.43)**

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PESCHAUD (M.). — Les **chemins de fer allemands** depuis 1920. (10 500 mots.)

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1931 **62. (01 & 669 .1**

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DESSENT (J.). — Variations de la **résistance dans les aciers** en fonction de la température. (1 300 mots & fig.)

1931 **669**

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MEUNIER (R. W.). — Le **procédé Grunewald de recuit en blanc.** (2 000 mots & fig.)

1931 **621 .134.3**

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MAGNEE (P.). — Les **locomotives à haute pression.** (6 000 mots & fig.)

1931 **721 .9**

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STERLING (A.). — **Poutres en béton** armées de barres préalablement tendues. (1 400 mots & fig.)

1931 **62. (01 & 691**

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1931 **621 .335**

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1931 **625 .216**

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1931 **621 .33 (.494)**

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1931 **621 .3 & 621 .9**

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1931 **385 .09 (.43)**

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1931 **621 .334 (.44)**

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OHL (W.). — Die **elektrische Treidelei** auf dem Rhein-Rhone-Kanal. (5 500 Wörter & Abb.)

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1931 **621 .132.8**

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1931 **621 .131.3 & 621 .134.3**

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1931 **621 .133.7**

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JULIUSBURGER (P.). — **Abdampfvorwärmer und Abdampfinjektor.** (Schluss folgt.) (7 800 Wörter & Abb.)

1931 **621 .134.2**
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MEINEKE (F.). — **Nachfüllschieber.** (1 400 Wörter & Abb.)

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1931 **621 .13 (.497)**
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1931 **621 .133.7**
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LINK (E.). — Das ADM-Verfahren zur **Wasserreinigung.** (7 200 Wörter & Abb.)

1931 **624 .63 (.44)**
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BERNHARD (R.). — Die **Eisenbeton-Bogenbrücke** « Albert Louppe » zwischen Brest und Plougastel. (3 200 Wörter & Abb.)

1931 **621 .111**
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1931 **621 .132.1 (.497.1)**
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1931 **621 .132.8**
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1931 **624 .32 (.73)**
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1931 **621 .392**
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Wood preservation. — Report of Committee XVII, American Railway Engineering Association. (15 400 words & fig.)

1930 **624 (.73)**
Bull. Amer. Ry. Eng. Association, December, p. 313.
Wooden bridges and trestles. — Report of Committee VII, American Railway Engineering Association. (3 500 words & fig.)

1930 **621 .39 (.73)**
Bull. Amer. Ry. Eng. Association, December, p. 321.
Electricity. — Report of Committee XVIII, American Railway Engineering Association. (1 700 words.)

1930 **693 (.73)**
Bull. Amer. Ry. Eng. Association, December, p. 325.
Masonry. — Report of Committee VIII, American Railway Engineering Association. (12 000 words.)

1931 **625 .143 (.73)**
Bull. Amer. Ry. Eng. Association, January, p. 345.
Rail. — Report of Committee IV, American Railway Engineering Association. (14 500 words, 7 tables & fig.)

1931 **621 .133.7 (.73)**
Bull. Amer. Ry. Eng. Association, January, p. 399.
Water service and sanitation. — Report of Committee XIII, American Railway Engineering Association. (19 000 words.)

1931 **625 .144.4 (.73) & 625 .17 (.73)**
Bull. Amer. Ry. Eng. Association, January, p. 439.
Report of special committee on **maintenance of way-work equipment.** (14 000 words & fig.)

1931 621 .138.5 (.73) & 725 .33 (.73)
Bull. Amer. Ry. Eng. Association, January, p. 483.
Shops and locomotive terminals. — Report of Committee XXIII, American Railway Engineering Association. (2 800 words & fig.)

1931 656 .257 (.73) & 657 (.73)
Bull. Amer. Ry. Eng. Association, January, p. 501.
Records and accounts. — Report of Committee XI, American Railway Engineering Association. (23 000 words & fig.)

1931 69 (.73) & 725 .3 (.73)
Bull. Amer. Ry. Eng. Association, February, p. 547.
Buildings. — Report of Committee VI, American Railway Engineering Association. (28 000 words & fig.)

1931 627 (.73)
Bull. Amer. Ry. Eng. Association, February, p. 607.
Rivers and harbors. — Report of Committee XXV, American Railway Engineering Association. (13 000 words.)

1931 625 (.73)
Bull. Amer. Ry. Eng. Association, February, p. 627.
Signals and interlocking. — Report of Committee X, American Railway Engineering Association. (5 600 words.)

1931 656 .2 (.73)
Bull. Amer. Ry. Eng. Association, February, p. 641.
Economics of railway operation : Method of increasing the traffic capacity of a railway. — Report of Committee XXI, American Railway Engineering Association. (26 000 words & fig.)

Electric Railway Journal. (New York.)

1931 659 (.73)
Electric Railway Journal, February, p. 66.
TOMPKINS (R. S.). — **Street railway publicity** then and now. (3 200 words & fig.)

1931 621 .338
Electric Railway Journal, February, p. 69.
Field work in **car research to be done at Brooklyn.** (700 words.)

1931 621 .336 (.73)
Electric Railway Journal, February, p. 71.
Trolley shoes prove advantageous in Detroit. (1 600 words & fig.)

1931 621 .338 (.73)
Electric Railway Journal, February, p. 74.
Automotive principles. — Applied in design of new Blackhall car. (3 000 words & fig.)

1931 621 .33 (.73) & 656 .1 (.73)
Electric Railway Journal, February, p. 78.
Trolley bus system inaugurated in Rockford. (600 words & fig.)

1931 621 .33 (.73) & 656 .1 (.73)
Electric Railway Journal, February, p. 79.
Trolley buses maintained by street car personnel in Chicago. (1 800 words & fig.)

1931 621 .335 (.73)
Electric Railway Journal, February, p. 83.
HICKOCK (H. C.). — Selecting **freight locomotives for interurban lines.** (3 000 words, 2 tables & fig.)

1931 621 .325 (.73)
Electric Railway Journal, February, p. 87.
Desirable features of **locomotives for interurban freight service.** (2 300 words & fig.)

1931 621 .333 (.44)
Electric Railway Journal, February, p. 92.
Compound motors tested on two French systems. (1 800 words.)

1931 621 .33 (.73)
Electric Railway Journal, February, p. 125.
Pennsylvania Railroad speeds **electrification** program. (1 500 words & fig.)

1931 621 .33 & 625 .62
Electric Railway Journal, February, p. 129.
Trolley bus operation in England expanding steadily. (2 000 words, 9 tables & fig.)

1931 621 .333 & 621 .338
Electric Railway Journal, February, p. 138.
Individual wheel drive adopted on Lehigh Valley transit car. (1 200 words & fig.)

Engineer. (London.)

1931 621 .392
Engineer, No. 3915, 23 January, p. 100.
Automatic arc welding. (1 100 words & fig.)

1931 625 .214
Engineer, No. 3915, 23 January, p. 114.
An oil lubricated **axle-box.** (1 000 words & fig.)

1931 621 .134.3
Engineer, No. 3916, 30 January, p. 124.
High-pressure locomotives. (Institution of mechanical engineers.) (2 600 words & fig.)

1931 625 .13 (.71)
Engineer, No. 3916, 30 January, p. 125.
Reinforcement of Stoney Creek **bridge.** (4 000 words & fig.)

1931 625 .4 (.42)
Engineer, No. 3916, 30 January, p. 136.
Enlargement of the Kingsway **subway** of the London County Council tramways. (2 000 words & fig.)

1931 621 .134.3
Engineer, No. 3916, 30 January, p. 138.
GRESLEY (H. N.). — **High-pressure locomotives.** (To be continued.) (5 500 words & fig.)

1931 656 .255 (.42) & 656 .283 (.42)
Engineer, N°. 3916, 30 January, p. 142.
The Clacton **Railway accident.** (800 words & fig.)

1931 669
The Metallurgist, p. 2, supplement to the Engineer, 30 January.
Corrosion testing. (1 800 words.)

1931 669 .1
The Metallurgist, p. 5, supplement to the Engineer, 30 January.
The phosphide eutectic in **cast iron.** (1 700 words & fig.)

1931 669
The Metallurgist, p. 6, supplement to the Engineer, 30 January.
Aluminium-silicon-magnesium casting alloys. (1 900 words & fig.)

1931 669 .1
The Metallurgist, p. 8, supplement to the Engineer, 30 January.
HATFIELD (W. H.). — **Steel ingots** (to be continued). (2 800 words & fig.)

1931 62. (01
The Metallurgist, p. 13, supplement to the Engineer, 30 January.
Damping of materials under alternating stresses. (1 100 words & fig.)

1931 669 .1
The Metallurgist, p. 14, supplement to the Engineer, 30 January.
Oxides in alloy steels. (1 500 words.)

1931 669 .1
Engineer, No. 3917, 6 February, p. 161.
Steel castings. (1 400 words.)

1931 621 .134.3 (.42)
Engineer, No. 3917, 6 February, p. 164.
GRESLEY (H. N.). — **High-pressure locomotives.** (Concluded.) (3 000 words & fig.)

1931 621 .132.7 (.32) & 621 .43 (.82)
Engineer, No. 3918, 13 February, p. 180.
100 H. P. **oil-engined shunting locomotive.** (900 words & fig.)

1931 621 .134.3
Engineer, No. 3918, 13 February, p. 182.
Institution of Mechanical Engineers. — Discussion on Mr. Gresley's paper on « **High-pressure locomotives** ». (5 600 words.)

1931 621 .134.3 & 621 .133.7
Engineer, No. 3918, 13 February, p. 190.
Locomotive feed. (1 000 words.)

1931 621. (06.2 (.42)
Engineer, No. 3918, 13 February, p. 199.
The British Industries Fair at Birmingham. (11 900 words & fig.)

1931 621 .134.3 (.42)
Engineer, No. 3919, 20 February, p. 206.
Institution of Mechanical Engineers (North Western Branch). **High pressures locomotives** by H. N. Gresley. (1 800 words.)

1931 625 .143.3 (.54)
Engineer, No. 3919, 20 February, p. 222.
The **failure of flat-bottom steel rails.** (900 words.)

1931 621
Engineer, No. 3920, 27 February, p. 230.
ROBERTSON (D.). — Vector methods of studying **mechanical vibrations.** (2 700 words & fig.)

1931 621 .1 (01 (06
Engineer, No. 3920, 27 February, p. 232.
The second **International Steam Table Conference.** (1 000 words.)

1931 621 .331 (.42)
Engineer, No. 3920, 27 February, p. 247.
A traction rectifier at Edinburgh. (900 words & fig.)

1931 62. (01 & 669 .1
The Metallurgist, supplement to the Engineer, No. 3920, 27 February, p. 19.
Strain etching figures. (2 100 words.)

1931 669 .1
The Metallurgist, supplement to the Engineer, No. 3920, 27 February, p. 21.
NELSON (W.). — Cyanides in the **case-hardening and heat treatment of steel.** (1 800 words & fig.)

1931 669 .1
The Metallurgist, supplement to the Engineer, No. 3920, 27 February, p. 25.
HATFIELD (W. H.). — **Steel ingots** (concluded). (2 400 words.)

1931 62. (01 & 669
The Metallurgist, supplement to the Engineer, No. 3920, 27 February, p. 26.
X-rays in metallurgical research. (2 200 words & fig.)

1931 62. (01 & 669
The Metallurgist, supplement to the Engineer, No. 3920, 27 February, p. 28.
LEWIS (S. J.). — **Spectroscopy as an aid in metallurgical analyses.** (2 600 words & fig.)

1931 621 .131.3 (.42)
Engineer, No. 3921, 6 March, p. 270.
Scientific and industrial research. — **Locomotive experimental station.** (400 words.)

1931 621 .165
Engineer, No. 3921, 6 March, p. 272.
CHRISTIE (A. G.). — Trends in **steam turbine development.** (3 300 words & fig.)

1931 621 .143.3
Engineer, No. 3921, 6 March, p. 275.
Failure of flat-bottom steel rails. (900 words & fig.)

1931 064 (.82)
Engineer, No. 3921, 6 March, p. 284.
Buenos-Aires **Trade Exhibition** (to be continued). (7 000 words & fig.)

1931 064 (.43)
Engineer, No. 3921, 6 March, p. 290.
The technical fair at Leipzig (to be continued). (4 100 words & fig.)

1931 621 .131.3 (.42)
Engineer, No. 3921, 6 March, p. 295.
A national locomotive testing plant. (1 000 words.)

1931 621 .33 (.54)
Engineer, No. 3921, 6 March, p. 299.
The South Indian Railways : Madras suburban electrification scheme. (1 100 words & fig.)

1931 621 .94 (.42)
Engineer, No. 3921, 6 March, p. 300.
Electrically-operated double **railway wheel lathe.** (1 200 words & fig.)

1931 064
Anglo-Spanish supplement to the Engineer, No. 3921, 13 March.
The Buenos Aires trade exhibition, 1931. (27 900 words & fig.)

Engineering. (London.)

1931 62. (01
Engineering, No. 3393, 23 January, p. 104.
The Hounsfield tensometer. (1 700 words & fig.)

1931 625 .4 (.42)
Engineering, No. 3393, 23 January, p. 107.
The enlargement of the Aldwych-Holborn tramway subway. (2 000 words & fig.)

1931 621 .133.1
Engineering, No. 3393, 23 January, p. 113.
The sampling of coal. (2 300 words.)

1931 625 .236 (.73)
Engineering, No. 3393, 23 January, p. 124.
Car-washing machines. (500 words.)

1931 656 .212.6 (.42)
Engineering, No. 3393, 23 January, p. 127.
Four-ton level luffing crane. (600 words & fig.)

1931 621 .39
Engineering, No. 3394, 30 January, p. 129.
HAIGH (B. P.). — **The dynamo-electric machine as a dynamometer.** (4 000 words & fig.)

1931 621 .116
Engineering, No. 3394, 30 January, p. 145.
The formation of boiler scale. (2 600 words.)

1931 621 .134.3
Engineering, No. 3394, 30 January, p. 149.
High-pressure locomotives. (The Institution of Mechanical Engineers). (4 500 words.)

1931 621 .94
Engineering, No. 3394, 30 January, p. 153.
Universal grinding machines with self-contained motor drives. (1 500 words & fig.)

1931 621 .134.3
Engineering, No. 3394, 30 January, p. 153.
GRESLEY (H. N.). — **High-pressure locomotives.** (8 500 words, 3 tables & fig.)

1931 385 .3 (.42)
Engineering, No. 3395, 6 February, p. 177.
The railways. (1 700 words.)

1931 621 .31
Engineering, No. 3395, 6 February, p. 185.
CHRISTIE (A. G.) and VIESSMAN (W.). — **Low cost peak load capacity with bleeder turbines.** (5 600 words & fig.)

1931 621 .91 (.42)
Engineering, No. 3395, 6 February, p. 188.
High-speed **planing machine** with electric drive. (800 words & fig.)

1931 669 .1
Engineering, No. 3395, 6 February, p. 191.
Patina steel. (800 words & fig.)

1931 62. (01 & 621 .392
Engineering, No. 3395, 6 February, p. 192.
FREEMAN (F. R.). — **The strength of arc-welded joints.** (1 500 words.)

1931 621 .31
Engineering, No. 3396, 13 February, p. 193.
STONEY (G.). — **The advantage of large overload capacity in central stations.** (2 500 words.)

1931 621. (062 (.42)
Engineering, No. 3396, 13 February, p. 209.
The British Industries Fair at Birmingham. (36 800 words & fig.)

1931 621 .134.3
Engineering, No. 3396, 13 February, p. 245.
The Institution of Mechanical Engineers. — Discussion on Mr. H. N. Gresley's paper on « **High-pressure locomotives** ». (7 600 words.)

1931 **621 .134.3**
Engineering, No. 3397, 20 February, p. 278.
GRESLEY (H. N.). — **High-pressure locomotives.** Paper read at the Institution of Mechanical Engineers : North-Western branch. (3 600 words.)

1931 **62. (01 & 669**
Engineering, No. 3397, 20 February, p. 280.
BACON (F.). — **Fatigue stresses,** with special reference to the **breakage of rolls.** (To be continued.) (4 900 words & fig.)

1931 **625 .4 (.73)**
Engineering, No. 3398, 27 February, p. 288.
SKINNER (F. W.). — **New York electric subway construction methods.** — IV. (4 200 words & fig.)

1931 **621 .1 (01 (06**
Engineering, No. 3398, 27 February, p. 296.
The second International Steam Table Conference, Berlin, June, 1930. (600 words.)

1931 **064 (.82)**
Engineering, No. 3399, 6 March, p. 317.
The British Empire Exhibition in Buenos Aires. (4 800 words.)

1931 **621 .392 (.43)**
Engineering, No. 3399, 6 March, p. 322.
BONDY (O.). — **The application of welding to steel constructional work in Germany.** (2 400 words & fig.)

1931 **064 (.43)**
Engineering, No. 3399, 6 March, p. 323.
The Leipzig fair. (4 600 words & fig.)

1931 **62. (01 & 669**
Engineering, No. 3400, 13 March, p. 347.
DOCHERTY (J. G.). — **The effect of rate of bending in notched-bar bending tests** (to be continued). (4 800 words & fig.)

1931 **624 .32 (.71)**
Engineering, No. 3400, 13 March, p. 351.
The Montreal harbour **bridge.** (2 800 words & fig.)

1931 **621 .134.3 (.42) & 621 .134.4 (.42)**
Engineering, No. 3400, 13 March, p. 357.
High pressure four-cylinder compound locomotive for the London & North Eastern Railway (to be continued). (1 200 words & fig.)

Engineering News-Record. (New York.)

1931 **624 .51**
Engineering News-Record, No. 3, 15 January, p. 102.
KEUSTER (E. F.). — **Multiple-span suspension bridges.** (2 400 words & fig.)

1931 **625 .4 (.73)**
Engineering News-Record, No. 4, 22 January, p. 136.
New York subways. — Problems in building Sixth Avenue Line. — V. (2 100 words & fig.)

1931 **385 .1**
Engineering News-Record, No. 6, 5 February, p. 223.
DANIELS (W. M.). — **The railroads : Their backs to the wall.** (4 500 words & fig.)

1931 **62 (08 (.73)**
Engineering News-Record, No. 6, 5 February, p. 240.
Present status of **major engineering projects.** (9 600 words & fig.)

1931 **721 (.73)**
Engineering News-Record, No. 8, 19 February, p. 307.
Problems of the tall building (a series of 8 articles on the). (29 400 words & fig.)

1931 **656 .211.4 (.73) & 725 .3**
Engineering News-Record, No. 9, 26 February, p. 348.
Union station and terminal for Cincinnati. (4 000 words & fig.)

1931 **385 (.73)**
Engineering News-Record, No. 9, 26 February, p. 355.
FOOS (I. D.). — **The epitaph of 444 railroads.** (4 200 words, 7 tables & fig.)

1931 **625 .111 (.73)**
Engineering News-Record, No. 9, 26 February, p. 360.
TRATMAN (E. E. R.). — **Grade separation** in large cities. (3 900 words & fig.)

1931 **625 .122 (.73)**
Engineering News-Record, No. 9, 26 February, p. 364.
Hydraulic fill and dump fill for high railroad embankment. (1 500 words & fig.)

Great Western Railway Magazine. (London.)

1931 **656 .213 (.42)**
Great Western Ry. Magazine, March, p. 120.
Cardiff general and riverside **stations to be rebuilt.** (1 500 words & fig.)

Institution of Engineers, Australia. (Sydney.)

1930 **62. (01 & 691**
Institution of Engineers, Australia, December, p. 445.
FARGHER (J. A.). — Stresses in the walls of elevated **cylindrical tanks of reinforced concrete.** (4 800 words & fig.)

1931 **691**
Institution of Engineers, Australia, January, p. 1.
VOGAN (H. J.). — **Some notes on proportioning concrete.** (8 500 words, 12 tables & fig.)

1931 **621 .13 (0 (.941)**
Institution of Engineers, Australia, January, p. 27.
BROADFOOT (J. W. R.). — **Locomotive progress on Western Australian Railways.** (2 300 words, 2 tables & fig.)

1931 **313 : 385 .113 (.49)**
Institution of Engineers, Australia, January, p. 34.
Railways of Australia. — Profit and loss. (250 words & fig.)

Journal of the Institute of Transport. (London.)

1931 621 .132.8 & 621 .4
Journal of the Institute of Transport, February, p. 170.
TRUTCH (C. J. H.). — **The oil engine and the railways.** (32 000 words).

1931 656 (.68)
Journal of the Institute of Transport, February, p. 205.
THORNYCROFT (Sir J. E.). — **Transportation and harbour development in South Africa.** (6 500 words.)

1931 656 .222.5 & 656 .232
Journal of the Institute of Transport, February, p. 212.
SHERRINGTON (C. E. R.). — **Passenger train services at home and abroad.** (5 400 words.)

1931 656
Journal of the Institute of Transport, March, p. 235.
CLEMINSON (H. M.). — **Shipping in its relation to road, rail and air, in co-operation and competition.** (18 000 words.)

1931 656
Journal of the Institute of Transport, March, p. 253.
BELL (R.). — **The study of transport problems.** (7 600 words.)

1931 388, 656 .1 & 656 .2
Journal of the Institute of Transport, March, p. 263.
BAKER (A. C.). — **Municipal passenger transport.** (5 800 words.)

Journal, Permanent Way Institution. (London.)

1930 627 .17
Journal, Perm. Way Inst. December, p. 257.
HILLS (H.). — **Up-to-date railway maintenance.** (5 500 words.)

1930 625 .143.3
Journal, Perm. Way Inst., December, p. 269.
CALLAGHAN (R. C.). — **Profiling and measurement of wear on railway rails.** (6 000 words.)

1930 625 .17
Journal, Perm. Way Inst., December, p. 282.
MARSHALL (A. D.). — **A gangers' time and charge sheet.** (10 000 words.)

1930 625 .144.2 &625 .151
Journal, Perm. Way Inst., December, p. 303.
GURD (R.). — **Superelevation and spacing between check rails.** (2 100 words & fig.)

1930 625 .142.3 (.62)
Journal. Perm. Way Inst., December, p. 308.
WALKER (J. C.). — **Steel sleepers in the Sudan.** (2 200 words.)

1930 625 .141 (.62)
Journal, Perm. Way Inst., December, p. 313.
BECKINSALE (F. T.). — **Stone ballasting.** (2 100 words.)

1930 625 .143.5
Journal, Perm. Way Inst., December, p. 318.
BASSINDALE (H. H.). — **Rail creep.** (3 800 words.)

Mechanical Engineering. (New York.)

1931 3
Mechanical Engineering, February, p. 99.
FLANDERS (R. E.). — **Engineering, economics, and the problem of social well-being.** (15 200 words.)

1931 621 .31
Mechanical Engineering, February, p. 111.
CHRISTIE (A. G.) and VIESSMAN (W.). — **Low-cost peak-load capacity with bleeder turbines.** (8 400 words & fig.)

1931 621 .134.3
Mechanical Engineering, February, p. 118.
HIRSHFELD (C. F.). — **High-pressure and high-temperature steam for locomotives.** (5 600 words & fig.)

1931 536
Mechanical Engineering, February, p. 135.
SMITH (L. B.) and KEYES (F. G.). — **Some additional volume data for superheated steam.** (1 600 words & fig.)

1931 536
Mechanical Engineering, February, p. 137.
OSBORNE (N. S.). — **Report of progress in steam research at the Bureau of Standards.** (1 500 words & fig.)

1931 656
Mechanical Engineering, March, p. 177.
PARMELEE (J. H.). — **Competition in the transport industry.** (5 000 words & fig.)

1931 621 .132.8 & 625 .4
Mechanical Engineering, March, p. 190.
New methods of rail transportation. (2 000 words & fig.)

1931 621 .116
Mechanical Engineering, March, p. 193.
ORROK (G. A.). — **The boiler room of the future.** (3 500 words & fig.)

1931 62. (01 & 669
Mechanical Engineering, March, p. 197.
VETTY (P. G. Mc.). — **Creep of metals at elevated temperatures.** (3 100 words & fig.)

1931 62. (01 & 385. (072
Mechanical Engineering, March, p. 201.
EVERETT (F. L.). — **European laboratories for the testing of materials.** (3 000 words & fig.)

1931 385 .1 (.73)
Mechanical Engineering, March, p. 223.
The U. S. A. railroads in 1929. (1 000 words.)

1931 62. (01
Mechanical Engineering, March, p. 226.
A direct method for obtaining stress-strain diagrams of notched-bar impact tests. (600 words & fig.)

1931 621 .116, 665 .882 & 669
Mechanical Engineering, March, p. 230.
Proposed specifications for fusion welding. (2 000 words.)

Modern Transport. (London.)

1931 656 (.932)
Modern Transport, No. 619, 24 January, p. 3.
Transport in New Zealand. — Need for State control. (1 600 words.)

1931 621 .33 (.436)
Modern Transport, No. 619, 24 January, p. 5.
STRAUSS (F.). — Electrification of Austrian Federal Railways. (3 600 words & fig.)

1931 621 .134.3
Modern Transport, No. 620, 31 January, p. 3.
GRESLEY (H. N.). — High-pressure locomotives. — Recent progress in design. (1 600 words.)

1931 621 .33 (.54)
Modern Transport, No. 620, 31 January, p. 5.
Electrification of South Indian Railway. (1 300 words & fig.)

1931 621 .132.8 (.43) & 621 .43 (.43)
Modern Transport, No. 620, 31 January, p. 7.
The Maybach Diesel rail car. (900 words & fig.)

1931 656 .1 (.42) & 656 .2 (.42)
Modern Transport, No. 620, 31 January, p. 15.
Solution of the road-rail problem. (2 700 words & fig.)

1931 656 .23
Modern Transport, No. 621, 7 February, p. 2.
Can railway charges be simplified? (900 words.)

1931 385 .3 (.42)
Modern Transport, No. 621, 7 February, p. 3.
Railway companies and the Royal Commission. (1 700 words.)

1931 625 .242 (.81)
Modern Transport, No. 621, 7 February, p. 4.
British-built rolling stock for Brazil. (900 words & fig.)

1931 388 (.43)
Modern Transport, No. 621, 7 February, p. 5.
Unified public transport in Hamburg. (5 700 words & fig.)

1931 659
Modern Transport, No. 622, 14 February, p. 3.
The sale of passenger transport. (2 400 words & fig.)

1931 621 .136 (.42)
Modern Transport, No. 622, 14 February, p. 5.
Self-trimming bunkers for locomotives. (1 500 words & fig.)

1931 656 .213 (.68)
Modern Transport, No. 622, 14 February, p. 7.
Development of the port of Beira. (900 words & fig.)

1931 656 .25 (0
Modern Transport, No. 622, 14 February, p. 8.
PUNTER (J. W.). — Progress in signal engineering. (900 words.)

1931 656 .23
Modern Transport, No. 622, 14 February, p. 10.
Can railway charges be simplified? (6 000 words.)

1931 385 .15
Modern Transport, No. 623, 21 February, p. 2.
The State and the Railways. (1 200 words.)

1931 385 .15
Modern Transport, No. 623, 21 February, p. 3.
MACASSEY (Sir L. L.). — Future of the railways. — The tendency towards nationalisation. (2 400 words.)

1931 656 .224 & 656 .234
Modern Transport, No. 623, 21 February, p. 5.
The sale of passenger transport. (1 700 words.)

1931 656 .1 & 656 .2
Modern Transport, No. 623, 21 February, p. 6.
Competition between rail and road. (1 800 words.)

1931 625 .142.3
Modern Transport, No. 623, 21 February, p. 10.
Elasticity in the permanent way. (700 words & fig.)

1931 621 .33
Modern Transport, No. 624, 28 February, p. 2.
Railway electrification. (1 000 words.)

1931 656 .1 (.42)
Modern Transport, No. 624, 28 February, p. 3.
COVENTRY (F. C. A.). — How the railways are using the roads. (3 600 words.)

1931 621 .132.8 (.41) & 621 .4 (.42)
Modern Transport, No. 624, 28 February, p. 7.
Rail cars in County Donegal. (300 words & fig.)

1931 385 .113 (.54)
Modern Transport, No. 624, 28 February, p. 8.
Railways in India. (1 800 words.)

1931 385 .14 (.42) & 656 .23 (0 (.42)
Modern Transport, No. 625, 7 March, p. 3.
Railway rates tribunal. (1 600 words.)

1931 625 .214
Modern Transport, No. 625, 7 March, p. 5.
BASSETT (H. N.). — Lubrication of ball and roller bearings. (1 600 words.)

1931 **656 .25 (.42)**
Modern Transport, No. 625, 7 March, p. 6.
Signalling and train control. — Recent progress. (900 words.)

1931 **621 .134.4 (.44)**
Modern Transport, No. 625, 7 March, p. 10.
VALLANTIN (R. G. E.). — **Compound locomotives in France.** — Experiments on the « Paris-Lyon-Mediterranée ». (1 500 words.)

1931 **385. (091 (.82)**
Modern Transport, No. 626, 14 March, p. 5.
The railway system of Argentine. — **Map** indicating variety of gauge and ownership. (Map.)

1931 **621 .132.1 (.82) & 625 .2 (.82)**
Modern Transport, No. 626, 14 March, p. 7.
Railway conditions in the Argentine. (3 200 words & fig.)

1931 **385. (091 (.82)**
Modern Transport, No. 626, 14 March, p. 11.
The Buenos Ayres Great Southern Railway. (3 000 words.)

1931 **385. (091 (.82)**
Modern Transport, No. 626, 14 March, p. 15.
The Central Argentine Railway. (2 100 words & fig.)

1931 **385. (091 (.82)**
Modern Transport, No. 626, 14 March, p. 17.
The Buenos Ayres and Pacific Railway. (2 400 words.)

1931 **385. (09.1 (.82)**
Modern Transport, No. 626, 14 March, p. 21.
The Buenos Ayres Western Railway. (2 000 words.)

1931 **385. (09.1 (.82)**
Modern Transport, No. 626, 14 March, p. 23.
The Entre Rios and Argentine North Eastern Railway. (1 600 words.)

1931 **385. (091 (.82)**
Modern Transport, No. 626, 14 March, p. 25.
The Cordoba Central Argentine Railway. (1 200 words & fig.)

1931 **385. (091 (.82)**
Modern Transport, No. 626, 14 March, p. 27.
The Transandine (metre gauge) Railway. (1 600 words.)

1931 **621 .335 (.82) & 621 .43 (.82)**
Modern Transport, No. 626, 14 March, p. 31.
Diesel-electric traction in the Argentine. (800 words & fig.)

1931 **656 .1 (.82)**
Modern Transport, No. 626, 14 March, p. 33.
Road transport in the Argentine. — Future dependent upon better roads. (2 000 words & fig.)

1931 **625 .62 (.82)**
Modern Transport, No. 626, 14 March, p. 35.
A notable **road passenger organisation.** — Anglo-Argentine **tramways.** (1 600 words & fig.)

1931 **064 (.82)**
Modern Transport, No. 626, 14 March, p. 41.
British Empire **Trade Exhibition.** (6 400 words & fig.)

Proceedings, American Society of Civil Engineers. (New York.)

1931 **624 .63 & 721 .4**
Proceed. Amer. Soc. Civil Eng., January, p. 3.
WEINER (B. L.). — Design of a **reinforced concrete skew arch.** (25 000 words, 14 tables & fig.)

1931 **385 .21**
Proceed. Amer. Soc. Civil Eng., January, p. 135.
KUTZ (C. W.). — **Relation between rail and waterway transportation :** a symposium. — Discussion. (700 words.)

1931 **624 .2**
Proceed. Amer. Soc. Civil Eng., January, p. 139.
NIELSEN (J. E.), RICHART (F. E.) and OLIVER (W. A.). — **Analysis of continuous frames** by distributing fixed-end moments. (2 300 words & fig.)

1931 **625 .13 (.73)**
Proceed. Amer. Soc. Civil Eng., February, p. 183.
KERR (D. J.), MEARS (F.) and BAXTER (J. C.). — **The eight-mile Cascade tunnel,** Great Northern Railways; a symposium. (27 000 words, 9 tables & fig.)

1931 **625 .13 (.73)**
Proceed. Amer. Soc. Civil Eng., February, p. 307.
BETTS (C. A.). — Completion of Moffat **tunnel** of Colorado. (800 words.)

1931 **624 .2**
Proceed. Amer. Soc. Civil Eng., February, p. 313.
MARTEL (R. R.) and MORRIS (C. T.). — **Analysis of continuous frames** by distributing fixed-end moments. (3 200 words & fig.)

Proceedings, Institution of Civil Engineers. (London.)

1930 **627**
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 86.
HOOD (Th. Ch.). — Reconstruction of Crawford **bridge** Singapore. (3 700 words & fig.)

1930 **624 .8**
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 89.
MOLONY (H. F.). — **Queensferry bridge.** (6 300 words & fig.)

1930 621 .135 & 621 .135.4
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 91.
CARTER (F. W.). — **The running of locomotives, with reference to their tendency to derail.** (8 100 words & fig.)

1930 627
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 92.
GIBSON (A. H.). — **An investigation of the back-water suppressor as applied to a hydro-electric installation.** (4 900 words, 4 tables & fig.)

1930 627
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 94.
HERROD (H.). — **Screw-piling,** with particular reference to screw-piled sewage sea out-rail works. (5 800 words, 1 table & fig.)

1930 627
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 95.
KENNEDY (D.). — **Construction of screw-pile jetty** at Bhavnagar. (3 600 words & fig.)

1930 725 .33
Proceedings, Instit. of Civil Eng., Selected Engineering papers, No. 103.
BELLAMY (H. E.). — **The construction of reinforced-concrete reservoirs** in South Australia. (4 000 words & fig.)

1930 725 .33
Proceedings, Instit. of Civil Eng. Vernon-Harcourt lecture, 1929-1930.
DIXON (S. M.). — **The work of the Committee of the Institution on the deterioration of structures in sea-water.** (9 900 words, 4 tables & fig.)

1930 621 .135. (0) & 624 .2
Proceedings, Instit. of Civil Eng. Vernon-Harcourt lecture, 1929-1930.
DALBY (W. E.). — **Lecture on the locomotive and bridge-oscillation.** (5 000 words, 1 table & fig.)

Proceeding, Institution of Mechanical Engineers. (London.)

1930 536 & 621 .1 (01
Proceed. Institut. Mechanical Eng., July, p. 985.
EAGLE (A.) and FERGUSON (R. M.). — **The coefficients of heat transfer from tube to water.** (30 400 words, 8 tables & fig.)

Railway Age. (New York.)

1931 656 .2 (.73)
Railway Age, No. 1, 3 January, p. 1.
Railway developments in 1930. (7 000 words.)

1931 385 .0 (.73)
Railway Age, No. 1, 3 January, p. 6.
Railway executives expect gradual improvement of business. (17 500 words.)

1931 385 .0 (.73)
Railway Age, No. 1, 3 January, p. 19.
ROBERTS (G. E.). — **Railroads indispensable! Revenues must be sufficient, competitors must prove economic legitimacy and pay all their costs.** (3 500 words.)

1931 385 .0 (.73)
Railway Age, No. 1, 3 January, p. 22.
JOHNSON (A. B.). — **Our future is largely in our own hands.** (2 800 words.)

1931 621 .13 (.73), 625 .1 (.73) & 625 .2 (.73)
Railway Age, No. 1, 3 January, p. 24.
HOWSON (E. T.). — **Railways will spend $800 000 000 for improvements in 1931.** (4 200 words & fig.)

1931 621 .13 (.73)
Railway Age, No. 1, 3 January, p. 31.
PECK (C. B.). — **Progress in locomotive design ahead of utilization.** (2 200 words & fig.)

1931 621 .33 (.73)
Railway Age, No. 1, 3 January, p. 33.
OEHLER (A. G.). — **Roads continue to push electrification programs.** (2 900 words & fig.)

1931 385 .11 (.71)
Railway Age, No. 1, 3 January, p. 36.
LYNE (J. G.). — **Canadian lines** expect upturn. (2 800 words & fig.)

1931 385 .11 (.725)
Railway Age, No. 1, 3 January, p. 39.
BECKMAN (R. W.). — **Mexican lines build for future.** (2 700 words & fig.)

1931 656 .1 (.73)
Railway Age, No. 1, 3 January, p. 42.
LAYNG (Ch.). — **Competition stirs railways.** — Greater efforts made to hold traffic to the rails. (4 200 words & fig.)

1931 385 .11 (.73)
Railway Age, No. 1, 3 January, p. 45.
PARMELEE (J. H.). — **A review of railway operations in 1930.** (11 000 words, 19 tables & fig.)

1931 625 .1 (.71 + .725 + .73)
Railway Age, No. 1, 3 January, p. 56.
BOYD (G. E.). — **Railway construction** increases in volume. Expenditures largest since 1923. (27 000 words & fig.)

1931 385 .1 (.73)
Railway Age, No. 1, 3 January, p. 69.
LYNE (J. G.). — **Railway finances in 1930.** (8 000 words, 8 tables & fig.)

1931 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 1, 3 January, p. 75.
STEEL (D. A.). — **Prices of railway materials** fall in 1930. (8 400 words & fig.)

1931 **625 .13 (.71 + .73)**
Railway Age, No. 1, 3 January, p. 82.
TAFT (W. J.). — **Locomotives ordered in 1930.** (3 500 words, 3 tables & fig.)

1931 **625 .24 (.71 + .73)**
Railway Age, No. 1, 3 January, p. 87.
KRAEGER (F. W.). — Freight cars ordered in 1930. (6 300 words, 3 tables & fig.)

1931 **625 .23 (.71 + .73)**
Railway Age, No. 1, 3 January, p. 95.
HUDSON (G. C.). — The 1930 **passenger car orders.** (5 600 words, 3 tables & fig.)

1931 **621 .132.8**
Railway Age, No. 1, 3 January, p. 101.
PECK (C. B.). — **Orders for rail motor cars** reflect business depression. (2 400 words & fig.)

1931 **621 .13 (.73) & 625 .2 (.73)**
Railway Age, No. 1, 3 January, p. 103.
LYNE (J. G.). — **Prices of railway equipment.** (5 000 words & fig.)

1931 **656 .1 (.73) & 656 .261 (.73)**
Railway Age, No. 1, 3 January, p. 107.
EMERY (J. C.). — **Wider use of motor transport.** (5 900 words & fig.)

1931 **656 .25 (.73)**
Railway Age, No. 1, 3 January, p. 111.
DUNN (J. H.). — **Signaling construction** continued in large volume during 1930. (2 800 words, 8 tables & fig.)

1931 **656 .25 (.73)**
Railway Age, No. 1, 3 January, p. 119.
HAMILTON (S. R.). — **Communication service** improved during 1930. (900 words, 4 tables & fig.)

1931 **385 .11 (.3)**
Railway Age, No. 1, 3 January, p. 121.
HEWITT (N. B.). — **Railways abroad.** (14 500 words & fig.)

1931 **656 .211 (.73) & 725 .31 (.73)**
Railway Age, No. 2, 10 January, p. 136.
Innovations in Burlington's Omaha station. (3 500 words & fig.)

1931 **621 .133**
Railway Age, No. 2, 10 January, p. 141.
Thermic syphons tested at the university of Illinois. (4 900 words & fig.)

1931 **385 .1 (.73)**
Railway Age, No. 2, 10 January, p. 147.
LANE (H. F.). — Rail executives reach agreement on four-system plan in East. (7 700 words.)

1931 **656 .1 (.73)**
Railway Age, No. 2, 10 January, p. 152.
Motor transport hearings at Chicago. (2 100 words.)

1931 **621 .132.5 (.73)**
Railway Age, No. 3, 17 January, p. 182.
Chesapeake and Ohio runs **road tests on 2-10-4 locomotives.** (2 800 words & fig.)

1931 **656 .211 (.73) & 725 .31 (.73)**
Railway Age, No. 3, 17 January, p. 187.
Open new **Union station** at Omaha. (5 000 words & fig.)

1931 **656 .253 (.42)**
Railway Age, No. 3, 17 January, p. 193.
Great Western automatic train control. (1 400 words & fig.)

1931 **656 .1 (.73) & 656 .23 (.73)**
Railway Age, No. 3, 17 January, p. 195.
Traffic losses shown at motor transport hearing. (4 800 words.)

1931 **656 .211 (.73) & 725 .31 (.73)**
Railway Age, No. 4, 24 January, p. 227.
SMITH (L.). — Colonial design embodied in new **Northern Pacific station.** (1 500 words & fig.)

1931 **656 .255 (.73)**
Railway Age, No. 4, 24 January, p. 230.
Pennsylvania installs **centralized traffic control** on 30.3 miles of single track. (1 800 words & fig.)

1931 **625 .234 (.73)**
Railway Age, No. 4, 24 January, p. 233.
WATERFILL (R. W.). — **Air conditioning on passenger equipment.** (2 100 words.)

1931 **656 .1 (.73)**
Railway Age, No. 4, 24 January, p. 234.
Railway and highway competition. (1 200 words.)

1931 **621 .13 & 621 .335**
Railway Age, No. 4, 24 January, p. 238.
ANDREWS (H. L.). — The electric locomotive improves its capability. (4 200 words & fig.)

1931 **625 .143 5 (.73)**
Railway Age, No. 4, 24 January, p. 244.
Flexibility provided in new tie plate assembly. (1 300 words & fig.)

1931 **656 .1 (.73) & 656 .261 (.73)**
Railway Age, No. 4, 24 January, p. 246.
Operating motor coaches and trucks saves money. (2 700 words & fig.)

1931 **656 .245 (.73) & 656 .225 (.73)**
Railway Age, No. 4, 24 January, p. 249.
Containers used in co-ordinated freight service. (1 300 words & fig.)

1931 385 .14 (.73)
Railway Age, No. 5, 31 January, p. 271.
LANE (H. F.). — Interstate Commerce Commission proposes new **rate-making law.** (7 500 words & fig.)

1931 625 .111 (.73)
Railway Age, No. 5, 31 January, p. 276.
Reading completes **grade separation work** at Manayunk, Pa. (4 900 words & fig.)

1931 385. (0 (.725)
Railway Age, No. 5, 31 January, p. 282.
Mexican national plan supported by Government. (2 000 words.)

1931 656 .1 (.73)
Railway Age, No. 5, 31 January, p. 283.
LISMAN (F. J.). — **Users of highways for private gain should pay adequate rental.** (2 700 words.)

1931 656 .1 (.73)
Railway Age, No. 5, 31 January, p. 285.
Motor transport hearings in Northwest. (2 000 words.)

1931 625 .212 & 625 .215
Railway Age, No. 5, 31 January, p. 289.
SYMINGTON (T. H.). — **Action of freight-car trucks.** (3 600 words & fig.)

1931 656 .225 (.73)
Railway Age, No. 6, 7 February, p. 315.
Building up tonnage trains. (2 700 words & fig.)

1931 656 .255 (.73)
Railway Age, No. 6, 7 February, p. 318.
FOX (E. N.). — **Centralized installation** on Boston and Maine Railway controls four junctions. (2 200 words & fig.)

1931 625 .142.2 (.73) & 691 (.73)
Railway Age, No. 6, 7 February, p. 323.
Giving permanency to **timber.** (3 600 words & fig.)

1931 625 .235 (.73)
Railway Age, No. 6, 7 February, p. 327.
Aluminium chairs for dining cars. (900 words & fig.)

1931 621 .133.7 (.73)
Railway Age, No. 6, 7 February, p. 329.
POWERS (T. F.). — A mechanical officer appraises results of **water treatment.** (2 400 words & fig.)

1931 385
Railway Age, No. 7, 14 February, p. 356.
ATTERBURY (W. W.). — The railroads will win through. — **New designs of equipment and co-ordination will end competitive menace.** Should be encouraged to engage in all forms of transport. (2 800 words.)

1931 627 (.73) & 656 .212.5 (.73)
Railway Age, No. 7, 14 February, p. 358.
Novel **floor construction** feature of new pier. (3 600 words & fig.)

1931 625 .244 (.73)
Railway Age, No. 7, 14 February, p. 363.
JONES (C. L.). — **Transporting perishables with « dry-ice ».** (2 200 words & fig.)

1931 625 .234
Railway Age, No. 7, 14 February, p. 365.
Western Railway Club talks **air conditioning.** (900 words.)

1931 656 .223.2 (.73)
Railway Age, No. 7, 14 February, p. 367.
REDDISH (L. C.). — **Transfers of lading** reduced. (1 500 words & fig.)

1931 621 .335 (.73)
Railway Age, No. 7, 14 February, p. 369.
BREHOB (F. H.). — New York Central to use forty-two **electric locomotives** for West Side improvement. (1 200 words & fig.)

1931 621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)
Railway Age, No. 7, 14 February, p. 371.
SMITH (C. E.). — A letter from the New Haven **(Stores, materials, accounts).** (4 900 words.)

1931 385 (.73)
Railway Age, No. 8, 21 February, p. 396; No. 9, 28 February, p. 437; No. 10, 7 March, p. 494.
A new era for the railroads. (15 000 words & fig.)

1931 385. (09.1 (.73)
Railway Age, No. 8, 21 February, p. 402.
Rehabilitating the Cotton Belt. (5 600 words & fig.)

1931 656 .212.6 (.73)
Railway Age, No. 8, 21 February, p. 409.
SHAFFER (A. W.). — **Skids** prove their worth. — New York Central and other roads find them valuable. (2 800 words & fig.)

1931 656 .254 (.73) & 656 .255 (.73)
Railway Age, No. 8, 21 February, p. 411.
Delaware and Hudson handles four ends of double track by **centralized control.** (1 800 words & fig.)

1931 621 .132.3 (.73)
Railway Age, No. 8, 21 February, p. 413.
Pacific 4-6-2 type locomotives on the New Jersey Central. (1 400 words & fig.)

1931 621 .335 & .621 .43
Railway Age, No. 8, 21 February, p. 415.
PETERS (E. H.) and CUMMINGS (I. R.). — Erie rail car equipped with two 300-H. P. engines. (1 400 words & fig.)

1931 621 .335 (.73) & 621 .43 (.73)
Railway Age, No. 9, 28 February, p. 439.
Burlington **gas-electrics** cut operating costs. (4 900 words & fig.)

1931 656 .223 (.73)
Railway Age, No. 9, 28 February, p. 443.
Keeping track of trains. (700 words & fig.)

1931 625 .13 (.73)
Railway Age, No. 9, 28 February, p. 445
MOTTIER (C. H.). — A complex **bridge-moving job.** (2 200 words & fig.)

1931 385 .1 (.73)
Railway Age, No. 9, 28 February, p. 449.
Control of railroads analyzed for House Committee. — Legislation recommended to bring all acquisitions under Interstate Commerce Commission jurisdiction. (12 500 words, 7 tables & fig.)

1931 625 .162 (.73)
Railway Age, No. 8, 28 February, p. 458.
Hydraulic crossing gate. (700 words & fig.)

1931 656 .1
Railway Age, No. 9, 28 February, p. 459.
Burlington substitutes motor coaches for trains. (2 300 words & fig.)

1931 656 .1 (.73) & 656 .261 (.73)
Railway Age, No. 9, 28 February, p. 462.
HUFFMAN (T. E.). — **Rail-truck service** passes experimental stage. (2 800 words & fig.)

1931 385 .21 (.73)
Railway Age, No. 9, 28 February, p. 483.
America's « Five-year plan ». (7 700 words.)

1931 625 .122 (.73)
Railway Age, No. 9, 28 February, p. 490.
Union station project involves six-million-yard grading job. (2 900 words & fig.)

1931 625 .142.2
Railway Age, No. 10, 7 March, p. 497.
KAY (P. Mc.). — Pointers on **railway lumber and tie buying.** (2 300 words & fig.)

1931 625 .132.3 (.73) & 625 .132.5 (.74)
Railway Age, No. 10, 7 March, p. 499.
4-6-4 and 4-8-4 type power for the Chicago, Burlington and Quincy. (1 400 words & fig.)

1931 656 .213 (.73)
Railway Age, No. 10, 7 March, p. 505.
Floating operations rendered more efficient. (1 800 words & fig.)

Railway Engineer. (London.)

1931 625 .143.2
Railway Engineer, February, p. 47.
Steel rails, past and present. (1 400 words.)

1931 621 .134.3
Railway Engineer, February, p. 49.
GRESLEY (H. N.). — **High-pressure locomotives.** (Abstract of paper read at Institution of Mechanical Engineers). (5 900 words & fig.)

1931 669 .1
Railway Engineer, February, p. 60.
A new high-speed steel hardening equipment. (800 words & fig.)

1931 621 .138.5 (.42)
Railway Engineer, February, p. 61.
The Derby **locomotive works** of the London Midland and Scottish Railway. — III. (To be continued.) (2 800 words & fig.)

1931 621 .131.2 & 621 .133 (01
Railway Engineer, February, p. 65.
NAJORK (E.) and WICHTENDAHL (R.). — **Economics of steam locomotive performance and mainte-** (4 200 words & fig.)

1931 656 .255 (.42)
Railway Engineer, February, p. 71.
Conversion of double lines into single tracks. — II. (4 200 words & fig.)

1931 625 .2 (01 & 625 .22
Railway Engineer, February, p. 77.
MARSHALL (C. F.). — **The motion of railway vehicles on a curved line.** — V. (To be continued.) (2 800 words & fig.)

1931 625 .141 & 625 .144.4
Railway Engineer, March, p. 87.
Shovel packing. (900 words.)

1931 621 .132.5 (.82)
Railway Engineer, March, p. 89.
New **4-6-2 type express passenger locomotive** for the Buenos Ayres Great Southern Railway. (1 600 words & fig.)

1931 625 .174 (.43)
Railway Engineer, March, p. 90.
A high-powered rotary **snow plough.** (1 800 words & fig.)

1931 621 .133.7 (.42)
Railway Engineer, March, p. 92.
The new Gresham **feed water heater for locomotives.** (1 000 words & fig.)

1931 625 .143.2 & 669 .1
Railway Engineer, March, p. 93.
ALLEN (C. J.). — The modern application of the **Sandberg sorbitic rail treatment.** — I. (To be continued.) (5 400 words, 3 tables & fig.)

1931 621 .133.1
Railway Engineer, March, p. 99.
BASSETT (H. N.). — **Spontaneous combustion and deterioration of coal in storage.** (3 600 words.)

1931 621 .138.5 (.42)
Railway Engineer, March, p. 101.
The Derby **locomotive works** of the London Midland and Scottish Railway. — IV. (4 500 words & fig.)

1931 625 .1 (.41)
Railway Engineer, March, p. 109.
Carrick Fergus to Whitehead **widening.** (1 800 words.)

1931 656 .1 (.42) & 656 .2 (.42)
Railway Engineer, March, p. 111.
London Midland & Scottish Railway Karrier « Ro-railer ». (2 000 words & fig.)

1931 621 .134.3 (.42)
Railway Engineer, March, p. 114.
High-pressure locomotives. (6 800 words.)

1931 621 .135.4 & 625 .22
Railway Engineer, March, p. 118.
MARSHALL (C. F. D.). — **The motion of railway vehicles on a curved line.** — VI. (4 000 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1931 625 .144.4 (.73)
Railway Engineering and Maintenance, January, p. 32.
Milwaukee finds large **ballast gangs** economical. (5 600 words & fig.)

1931 621 .133.7 (.73) & 725 .33 (.73)
Railway Engineering and Maintenance, January, p. 38.
New York Central builds largest **(water) treating plant** at Elkhart, Ind. (2 800 words & fig.)

1931 621 .392
Railway Engineering and Maintenance, January, p. 42.
Welding in bridge work; its economy and reliability. (1 400 words.)

1931 621 .5
Railway Engineering and Maintenance, January, p. 43.
How to **prevent freezing of air lines.** (250 words.)

1931 625 .175
Railway Engineering and Maintenance, January, p. 44.
KNOWLES (C. R.). — How to keep a **motor car** running. — Part I. (4 500 words & fig.)

1931 625 .142.2 (.73)
Railway Engineering and Maintenance, January, p. 48.
MARKWARDT (L. J.). — Tests indicate the suitability of **woods for crossties.** (1 200 words & fig.)

1931 625 .122
Railway Engineering and Maintenance, February, p. 124.
BLAESS (A. F.). — **Slides** can be cured. (4 500 words & fig.)

1931 625 .13 (.73)
Railway Engineering and Maintenance, February, p. 128.
How the Baltimore and Ohio lines **tunnels.** (6 800 words & fig.)

1931 625 .142 (.73) & 691 (.73)
Railway Engineering and Maintenance, February, p. 134.
Making timber last longer. (2 800 words & fig.)

1931 625 .142.2 (.73) & 691 (.73)
Railway Engineering and Maintenance, February, p. 137.
MUSSELMAN (C. B.). — The Lehigh Valley's **tie-treating** policy after 21 years. (2 700 words & fig.)

1931 625 .175
Railway Engineering and Maintenance, February, p. 139.
KNOWLES (C. R.). — How to keep a **motor car** running. — Part II. (4 900 words & fig.)

1931 625 .111 & 625 .173
Railway Engineering and Maintenance, February, p. 143.
WELCH (R. S.). — Plan **turnout renewals** carefully. (1 600 words & fig.)

1931 625 .144.4 (.73)
Railway Engineering and Maintenance, March, p. 236.
The biggest problem today **(maintenance equipment).** (5 400 words & fig.)

1931 625 .144.4 (.73)
Railway Engineering and Maintenance, March, p. 240.
The value of **equipment** lies in its effective use. (4 000 words & fig.)

1931 625 .144.4 (.73)
Railway Engineering and Maintenance, March, p. 244.
The care and repair of equipment on the Pennsylvania. (4 900 words & fig.)

1931 698 (.71)
Railway Engineering and Maintenance, March, p. 250.
Painting the Quebec bridge. A man-size job. (4 200 words & fig.)

1931 625 .144.4 (.73)
Railway Engineering and Maintenance, March, p. 257.
Mechanical appliances proving their worth. (2 200 words & fig.)

Railway Gazette. (London.)

1931 385. (08 (.94)
Railway Gazette, No. 4, 23 January, p. 115.
Economic **position of the Australian Railways.** (2 100 words.)

1931 656 .211 (.54) & 725 .31 (.54)
Railway Gazette, No. 4, 23 January, p. 117.
New Bombay **Central station.** (2 400 words & fig.)

1931 656 .1 (.42) & 656 .2 (.42)
Railway Gazette, No. 4, 23 January, p. 123.
The new « **Ro-railer** », London Midland & Scottish Railway. (1 400 words & fig.)

1931 385 .52 (.42)
Railway Gazette, No. 4, 23 January, p. 130; No. 5, 30 January, p. 172.
Railway wages and conditions inquiry. (16 000 words.)

1931 621 .134.3
Railway Gazette, No. 5, 30 January, p. 153.
GRESLEY (H. N.). — **High-pressure locomotives.** (2 400 words & fig.)

1931 656 .1 (.42) & 656 .2 (.42)
Railway Gazette, No. 5, 30 January, p. 159.
« Ro-railer » demonstration, London Midland and Scottish Railway. (1 300 words & fig.)

1931 625 .4 (.42)
Railway Gazette, No. 5, 30 January, p. 163.
Aerial ropeway for transporting coal. (800 words & fig.)

1931 621 .134.3
Railway Gazette, No. 5, 30 January, p. 169.
Institution of Mechanical Engineers. — (Discussion on Mr. Gresley's paper on **« high-pressure locomotives »**). (1 900 words.)

1931 659 (.54)
Railway Gazette, No. 6, 6 February, p. 194.
Publicity work on Indian Railways. (1 200 words.)

1931 385 .3 (.42)
Railway Gazette, No. 6, 6 February, p. 195.
Railway Companies discuss criticisms and indicate what has been accomplished. (2 100 words.)

1931 621 .134.1
Railway Gazette, No. 6, 6 February, p. 197.
Re-arrangement of **locomotive rods.** — A method devised to relieve the **stress on crank pins.** (800 words & fig.)

1931 656 .21 (.42) & 656 .225 (.42)
Railway Gazette, No. 6, 6 February, p. 199.
Goods transhipment reorganisation, Great Western Railway. (1 600 words.)

1931 621 .136.1 (.42)
Railway Gazette, No. 6, 6 February, p. 200.
Beyer-Garratt locomotive with rotating self-trimming coal bunker, London Midland & Scottish Railway. (700 words.)

1931 385 .52 & 656 .1
Railway Gazette, No. 7, 13 February, p. 226.
BAWTREE (A. E.). — **Railwaymen's wages (and road transport).** — A new solution of the problem. (1 200 words.)

1931 656 .211.5 (.44)
Railway Gazette, No. 7, 13 February, p. 229.
Ticket printing machines in use at French railway stations. (3 100 words & fig.)

1931 656 .1 (.42)
Railway Gazette, No. 7, 13 February, p. 235.
Mechanical transport maintenance, Great Western Railway. (1 800 words & fig.)

1931 656 .1 (.42) & 656 .2 (.42)
Railway Gazette, No. 7, 13 February, p. 241.
The technical features of the London Midland and Scottish Railway. — Karrier **« Ro-railer ».** (2 700 words & fig.)

1931 621 .33 (.492)
Railway Gazette, No. 8, 20 February, p. 268.
Electric traction in Holland. (900 words.)

1931 656 .212.5 (.42)
Railway Gazette, No. 8, 20 February, p. 275.
New **marshalling yard** at Acton, Great Western Railway. (800 words & fig.)

1931 625 .232 (.42)
Railway Gazette, No. 8, 20 February, p. 277.
New train for Leeds and Glasgow service, London and North Eastern Railway. (700 words & fig.)

1931 621 .33 (.492)
Railway Gazette, No. 8, 20 February, p. 281.
Electric traction on the Netherlands Railways. (4 500 words & fig.)

1931 621 .133.17 (.42)
Railway Gazette, No. 8, 20 February, p. 287.
The new Gresham **feed-water heater for locomotives.** (900 words & fig.)

1931 621 .134.3 (.44)
Railway Gazette, No. 9, 27 February, p. 304.
Paris-Lyon-Mediterranée Railway and **compounding.** (1 300 words.)

1931 621 .134.3 (.44)
Railway Gazette, No. 9, 27 February, p. 310.
Compound locomotives of the Paris-Lyon-Méditerranée Railway. (2 200 words.)

1931 656 .213 (.42)
Railway Gazette, No. 9, 27 February, p. 313.
New **station** for Cardiff, Great Western Railway. (900 words & fig.)

1931 656 .1 & 656 .2
Railway Gazette, No. 9, 27 February, p. 314.
Railways and road transport. (3 300 words.)

1931 625 .232 (.68)
Railway Gazette, No. 9, 27 February, p. 317.
New **coaching stock** for the Rhodesia Railways. (1 000 words & fig.)

1931 621 .338 (.42)
Railway Gazette, No. 10, 6 March, p. 345.
New **rolling-stock for the London tube railways.** (700 words & fig.)

1931 621 .132.8 (.41) & 621 .43 (.41)
Railway Gazette, No. 10, 6 March, p. 356.
Petrol rail car on Donegal Railways. (800 words & fig.)

1931 621 .132.3 (.73)
Railway Gazette, No. 10, 6 March, p. 357.
New **4-6-2 type express passenger locomotive,** Buenos Ayres Great Southern Railway. (800 words & fig.)

1931 625 .142
Railway Gazette, No. 10, 6 March, p. 358.
A new suggestion for **packing permanent way. — Steel channel sleepers, and wooden wedges.** (400 words & fig.)

1931 625 .233 (.43)
Railway Gazette, No. 10, 6 March, p. 359.
The Pintsch **electric train-lighting** system. (1 600 words & fig.)

1931 625 .245 (.42)
Railway Gazette, No. 10, 6 March, p. 360.
Screw-over **side tip wagons.** (200 words & fig.)

1931 656 .211.7
Railway Gazette, No. 11, 13 March, p. 398.
The case against the **train ferry.** (1 200 words.)

1931 621 .132.3 (.42)
Railway Gazette, No. 11, 13 March, p. 399.
New **three-cylinder 2-6-0 type locomotives,** Southern Railway. (200 words & fig.)

1931 625 .231 (.66)
Railway Gazette, No. 11, 13 March, p. 400.
New **rolling-stock** for the Nigerian Railway. (800 words & fig.)

1931 656 .1 (.42)
Railway Gazette, No. 11, 13 March, p. 403.
The Scottish Motor Traction Co. Ltd. (Operating in conjunction with the L. M. S. and L. N. E. Railways.) (3 300 words & fig.)

Railway Magazine. (London.)

1931 385. (09.1 (.68)
Railway Magazine, February, p. 83.
LAWRENCE (H. S.). — The **South African Railways.** No. 1. (To be continued.) (2 000 words & fig.)

1931 656 .222.1 (.42)
Railway Magazine, February, p. 95.
ALLEN (C. J.). — **British locomotive practice and performance.** (6 000 words & fig.)

1931 656 .253 (.42)
Railway Magazine, February, p. 111.
Re-signalling of Victoria and Exchange stations, Manchester. (4 000 words & fig.)

1931 621 .134.3 (.42)
Railway Magazine, March, p. 167.
High-pressure locomotive No. 10 000, London and North Eastern Railway. (2 000 words & fig.)

1931 385. (09.1 (.68)
Railway Magazine, March, p. 177.
LAWRENCE (H. S.). — **The South African Railways.** — No. II. (3 600 words & fig.)

1931 625 .3 (.494)
Railway Magazine, March, p. 195.
Through the heart of the Alps by the « **Glacier Express** ». (3 600 words & fig.)

1931 656 .221 (.42)
Railway Magazine, March, p. 207.
ALLEN (C. J.). — **British locomotive practice and performance.** (5 600 words & fig.)

Railway Mechanical Engineer. (New York.)

1931 621 .132.5 (.73)
Railway Mechanical Engineer, January, p. 1.
Cotton Belt buys modern **freight power.** (2 900 words & fig.)

1931 625 .215 (.73)
Railway Mechanical Engineer, January, p. 6.
SYMINGTON (T. H.). — **Action of four-wheel freight-car trucks.** (9 100 words & fig.)

1931 621 .138.5 (.73)
Railway Mechanical Engineer, January, p. 14.
Wheeling a switcher in 37 minutes. (2 900 words & fig.)

1931 385 .3 (08 (.73) & 621 .118 (.73)
Railway Mechanical Engineer, January, p. 19.
PACK (A. G.). — **Defective locomotives** continue decline. (2 000 words & fig.)

1931 621 .133. (01 & 621 .134 .3
Railway Mechanical Engineer, January, p. 21.
HIRSHFELD (C. F.). — **High-pressure steam for locomotives.** (7 000 words & fig.)

1931 625 .26 (.73)
Railway Mechanical Engineer, January, p. 32.
With the car foremen and inspectors. — Proviso hump yard **car-repair facilities.** (2 700 words & fig.)

1931 621 .39 (.73)
Railway Mechanical Engineer, February, p. 59.
SCOTT (W. S.). — **Industrial electric heating for railway shops** (to be continued). (3 800 words & fig.)

1931 625 .234 (.73)
Railway Mechanical Engineer, February, p. 63.
CANDEE (A. H.). — **Air-conditioning requirements for railway passenger cars.** (3 500 words & fig.)

1931 621 .132.5 (.73)
Railway Mechanical Engineer, February, p. 67.
Twenty-five **4-8-4 type locomotives** for the Wabash Railway. (2 000 words & fig.)

1931 313 : 621 .13 (.73)
Railway Mechanical Engineer, February, p. 69.
Locomotives ordered in 1930 reflect business depression. (2 900 words, 7 tables & fig.)

1931 625 .242 (.73)
Railway Mechanical Engineer, February, p. 72.
Katy builds 70-ton **gondolas.** (700 words & fig.)

1931 621 .135.2
Railway Mechanical Engineer, February, p. 74.
Roller bearings for locomotives and cars. (3 800 words & fig.)

1931 313 : 625 .2 (.73)
Railway Mechanical Engineer, February, p. 77.
Small number of **cars ordered in 1930.** (1 400 words, 6 tables & fig.)

1931 385 (.73)
Railway Mechanical Engineer, February, p. 80.
A fight for your jobs. — The program formulated for the railways by the Association of railway executives. (1 200 words.)

1931 621 .133.7 (.73)
Railway Mechanical Engineer, February, p. 98.
Water conditioner tests. (1 600 words & fig.)

Railway Signaling. (Chicago.)

1931 656 .255 (.73)
Railway Signaling, February, p. 37.
The Delaware and Hudson installs **centralized traffic control** on 12.6 miles of line. (4 000 words & fig.)

1931 656 .257 (.73)
Railway Signaling, February, p. 42.
Automatic interlocker protects gauntlet track. (1 500 words & fig.)

1931 656 .255 (.73)
Railway Signaling, February, p. 44.
FOX (E. N.). — **Centralized traffic control** installation handles four junctions and 17 miles of line on Boston and Maine Railway. (6 300 words & fig.)

1931 656 .253 (.73)
Railway Signaling, February, p. 51.
French railways adopt **color-light signals.** (800 words & fig.)

1931 656 .255 (.73)
Railway Signaling, February, p. 52.
BRINKWORTH (J. J.). — Results of **centralized control** on New York Central Railway. (900 words.)

1931 625 .258 (.43) & 656 .254 (.43)
Railway Signaling, February, p. 53.
Rapid **classification** in Germany. (1 800 words & fig.)

1931 621 .85 + 656 .25
Railway Signaling, February, p. 56.
ZANE (W. F.). — Burlington develops **signal repair shop** at Aurora, Illinois. (2 600 words & fig.)

1931 656 .253 (.42)
Railway Signaling, February, p. 59.
Automatic train control on Great Western of England. (1 200 words & fig.)

1931 656 .254 (.73) & 656 .255 (.73)
Railway Signaling, March, p. 73.
BENDER (F. W.). — **Centralized traffic control** postpones four-tracking on Central of New Jersey. (2 300 words & fig.)

1931 656 .258 (.73)
Railway Signaling, February, p. 76.
Three large **interlockings** installed by Union Pacific at Omaha. (3 000 words & fig.)

1931 385 .3 (.73) & 656 .258 (.73)
Railway Signaling, March, p. 80.
ENGELHARDT (H. L.). — State Commission formulates requirements of **automatic interlockers.** (1 100 words.)

1931 656 .258 (.73)
Railway Signaling, March, p. 81.
ZANE (W. F.). — New control system used at **electric interlocking** on the Burlington Railway. (3 500 words & fig.)

1931 656 .254 (.73) & 656 .258 (.73)
Railway Signaling, March, p. 85.
NOBLE (S. E.). — **Remotely-controlled interlocking** solves problem on Chicago & North Western Railway. (1 400 words & fig.)

1931 385 .3 (.73) & 656 .253 (.73)
Railway Signaling, March, p. 87.
Interstate Commerce Commission approves Pennsylvania cab signaling. (2 100 words & fig.)

1931 656 .25 (.73)
Railway Signaling, March, p. 89.
POST (E. K.). — **Signaling the Philadelphia terminal of the Pennsylvania.** (6 000 words & fig.)

1931 656 .254 (.73)
Railway Signaling, March, p. 98.
The American Railway Association Joint Committee **stop signs.** (5 500 words & fig.)

1931 656 .258
Railway Signaling, March, p. 102.
Locks for mechanical levers. (1 400 words.)

1931 656 .253
Railway Signaling, March, p. 103.
Track-circuit regulation. (3 400 words & fig.)

South African Railways and Harbours Magazine. (Johannesburg.)

1931 385. (09 (.62)
South African Rys. and Harbours Mag., Jan., p. 114.
The Sudan and its railways. (3 700 words & fig.)

1931 656 .254 (.68)
South African Lys. and Harbours Mag., Febr., p. 284.
HUTH (E. F. A.). — An introduction to the **automatic telephone exchange.** (3 500 words & fig.)

In Spanish.

Gaceta de los Caminos de hierro. (Madrid.)

1931 656 .2 (.42) & 338 .9 (.42)
Gaceta de los Caminos de hierro, nº 3645, 20 de Enero, p. 25; nº 3646, 1º de Febrero, p. 37.
Los ferrocarriles y los transportes aereos en la Gran Bretaña. (5 400 palabras & fig.)

1931 625 .234
Gaceta de los Caminos de hierro, nº 3647, 10 de Febrero, p. 49.
Entretenimiento de las instalaciones de **calefacción electrica** de los trenes en las talleres de Neuaubing de la Reichsbahn. (1 500 palabras.)

Revista de Obras Publicas. (Madrid.)

1931 625 .1 (.460)
Revista de Obras Publicas, nº 3, 1º de Febrero, p. 45.
DIZ TIRADO (P.). — **Ferrocarril de Ferrol-Gijón.** (2 500 palabras & fig.)

1931 624 .61 (.460)
Revista de Obras Publicas, nº 3, 1º de Febrero, p. 54.
PAZ MAROTO (J.). — **Viaducto del Tossa.** (1 800 palabras & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1930 625 .13 (.52)
Annali dei lavori pubblici, dicembre, p. 1062.
ROMANO (D.). — **La galleria di Tanna, in costruzione lungo la linea Atami-Numazu (Giappone).** (14 000 parole & fig.)

1930 624 .32 (.438) & 621 .392 (.438
Annali dei lavori pubblici, dicembre, p. 1085.
BRYLA (S.). — **Il ponte metallico di Lowicz, i** Polonia. — Il primo, in Europa, saldato con l'arco elet trico. (3 800 parole & fig.)

L'Ingegnere. (Roma.)

1930 62. (0
L'Ingegnere, agosto, p. 516.
VOLTERRA (E.). — **La fotoclasticità e le sue appli** cazioni nell' interno dei corpi elastici. (5 400 parol & fig.)

1930 62. (0
L'Ingegnere, dicembre, p. 816.
VOLTERRA (E.). — Metodi ed applicazioni dell **fotoelasticità.** (6 000 parole & fig.)

1930 625 .4 (0
L'Ingegnere, dicembre, p. 827.
VALLECCHI (U.). — Limiti di **convenienza economic** delle ferrovie metropolitane. (3 300 parole & fig.)

1930 624 (0
L'Ingegnere, dicembre, p. 832.
BELLUZZI (O.). — Formule per il **portale a du** piani con i piedritti incastrati. (4 500 parole & fig.)

1931 625 .13 (.45
L'Ingegnere, gennaio, p. 2.
La **comunicazioni fra l'oriente e l'occidente** di Napol e la nuova galleria sotto Monte Echia. (6 000 parol & fig.)

Rivista delle Comunicazioni ferroviarie. (Roma.)

1931 656 .2
Riv. delle Comunic. ferrov., nº 5, 1º marzo, p. 18.
MALTESE (S.). — **La negoziabilità dei document di trasporto ferroviario.** (2 000 parole.)

In Dutch.

De Ingenieur. (Den Haag.)

1931 62. 01 & 721 .9
De Ingenieur, Nr 6, 6 Februari, p. 33.
SPANJAERDT SPECKMAN (L. J.). — Bijdrage tot de berekening van **dekkingen van gewapend beton tegen artillerievuur.** (6 000 woorden & fig.)

1931 385. (09.1 (.92)
De Ingenieur, Nr 9, 27 Februari, p. 13.
VAN KREEL (B. H. A.). — **Het verkeer ter Oostkus** van Sumatra, dat der Deli Spoorweg Maatschappij in het bijzonder. (15 000 woorden & fig.)

Spoor- en Tramwegen. (Utrecht.)

1931 **625 .234**

Spoor- en Tramwegen. N^r 3, 3 Februari, p. 53.

LABRIJN (P.). — De nieuwe tweedeelige **stoomkoppelingen** der spoorwegvoertuigen. (1 800 woorden & fig.)

1931 **625 .2 (.492)**

Spoor- en Tramwegen. N^r 3, 3 Februari, p. 67.

BOLLEMAN KUILSTRA (E.). — **Indienststelling van nieuw materieel.** (1 100 woorden & fig.)

1931 **385. (07.2 (.492)**

Spoor- en Tramwegen. N^r 4, 17 Februari, p. 83.

MATTHIJSEN (H. L.). — Het **werk van den keuringsdienst** der Nederlandsche Spoorwegen (wordt vervolgt). (2 400 woorden & fig.)

In Polish.

INŻYNIER KOLEJOWY. (Warszawa).

1931 **621 .131.1**

Inzynier Kolejowy. Lutego, str. 52.

OGUREK (O.). — **Moc graniczna parowozów.** (3 800 slowa & rys.)

1931 **621 .132.8**

Inzynier Kolejowy. Lutego. str. 58.

Wagony motorowe. (3 700 slowa & rys.)

In Portuguese.

Boletim do Instituto de Engenharia (S. Páulo). (Brasil.)

1930 **727 .5 (.73)**

Boletim do Instituto di Engenharia, Dezembro, p. 197.

VOELLMY (A. B.). — O « **Bureau of Standards** » em Washington. (8 000 palavras.)

1930 **624 .2 (01**

Boletim do Instituto di Engenharia, Dezembro, p. 208.

REIS (F. dos S.). — Ainda algumas ponderações sobre as nossas pesquizas relativas aos **theoremas de A. Castigliano.** (1 500 palavras & fig.)

1930 **621 .33**

Boletim do Instituto di Engenharia, Dezembro, p. 219.

VELHO DA COSTA (F. B.). — **Tracção electrica suburbana.** (6 600 palavras & fig.)

Revista das Estradas de ferro. (Rio de Janeiro.)

1931 **621 .33 (.43)**

Revista das Estradas de ferro. 30 de Janeiro, p. 26.

A tracção electrica na Allemanha. (2 000 palavras & fig.)

10.680. — Publisher : M. Weissenbruch Co., Ltd., Printer to the King, 49, rue du Poinçon, Brussels.

VOL. XIII. — N° 6. JUNE 1931.

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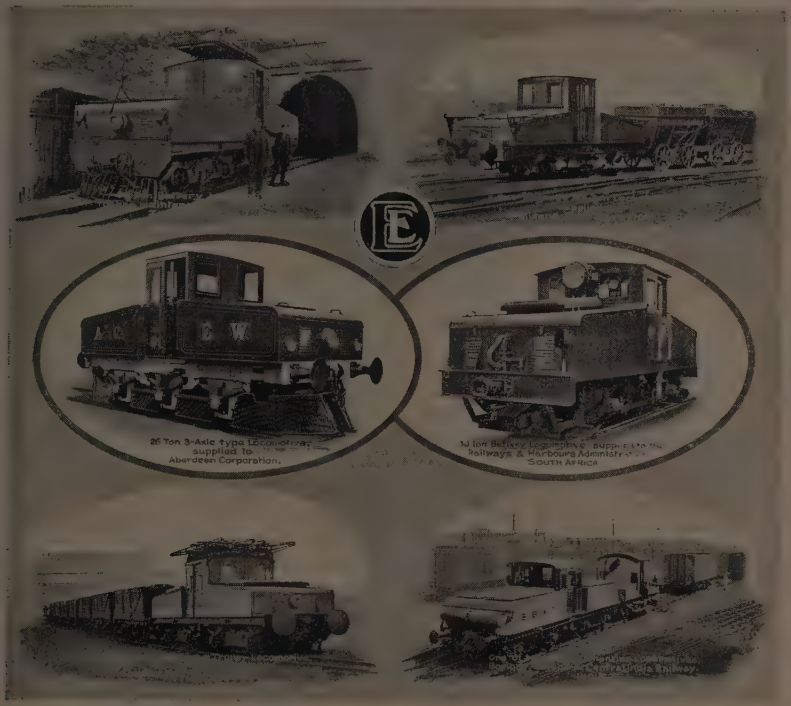

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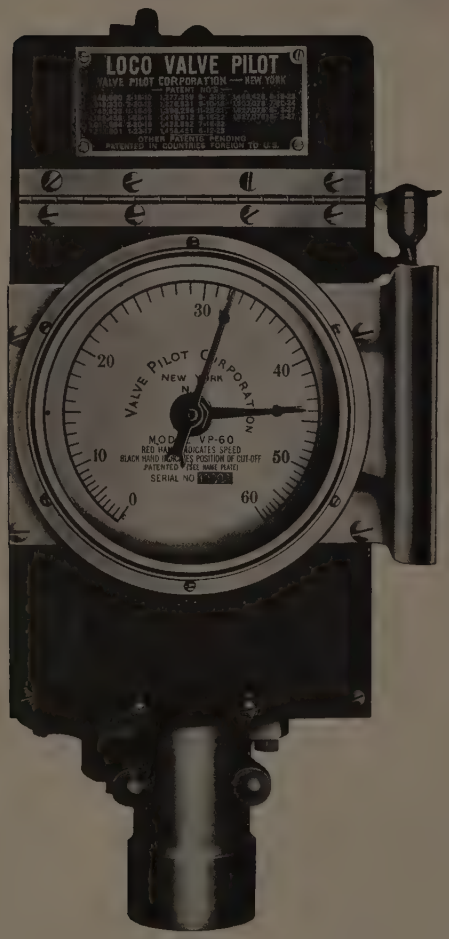

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Locomotives and Railcars fitted with
Beardmore Patent Oil Engines
have proved reliable and economical
under service conditions.

One of the 360 B.H.P. Diesel-Electric locomotives for the Indian State Railways (N.W.I.)

Locomotives and Railcars fitted with Beardmore Engines in service in Canada and other parts of the world had completed, up to the end of 1929, over 2 1/2 million miles.

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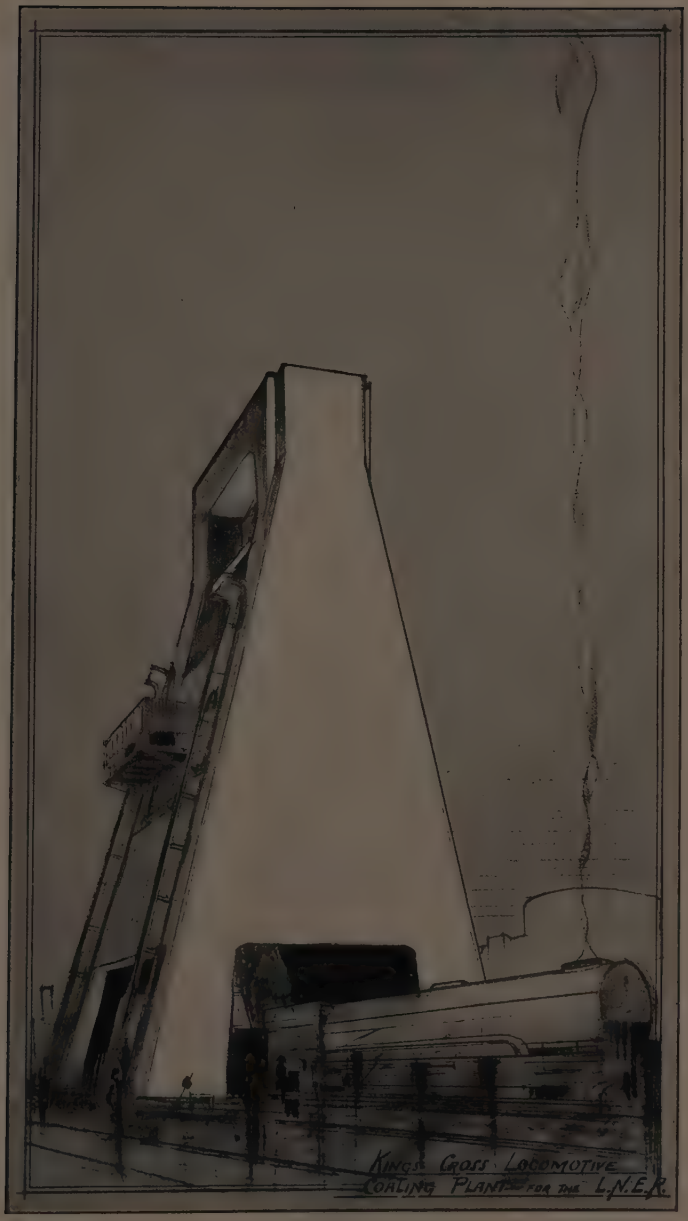

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ATLANTIC HOUSE, HOLBORN VIADUCT, LONDON

FIRE TUBE SUPERHEATERS

Integrally Forged Return Bends

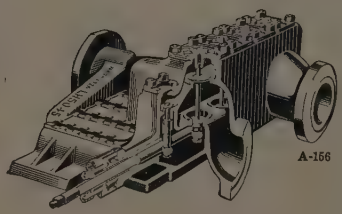
A-155

Long experience has conclusively demonstrated the superiority of Elesco (Schmidt) superheaters from the standpoint of design and construction, as well as for reliability and efficiency in operation. This is due very largely to the fact that return bends, forged integrally with the tubing, are used exclusively to form the loops of the superheater elements or units. These bends are machine-forged without the use of either additional material or a flux.

Units so formed are homogeneous and as strong as the tubing of which they are made. In addition, the thickness of the metal is increased at the bend so that it is stronger than the tubing itself. Being of constant internal area with smooth surfaces, the bends offer no restriction to the flow of steam. The smooth exterior surface also avoids collection of soot, ashes or cinders.

Millions of these return bends are in daily use under the severest service on steam railroads all over the world, where Elesco superheaters are now standard.

Collectors



A-156

Collectors for Elesco superheaters are made of the very best gray iron and are designed to meet internal stresses to which they are subjected through variations in temperature and constant vibration.

In the illustration is shown a recent development of the finger type having the multiple-valve throttle or regulator integral with the casting. Without complicating the smokebox arrangement, it provides for steam at full boiler pressure always circulating through the units, which protects them against overheating, and control of the steam supply between the superheater and the cylinders. The steam supply to the cylinders is finely graduated by consecutive opening and closing of the series of small multiple valves. This type of collector is rapidly being adopted for every class of locomotive service.

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A-422

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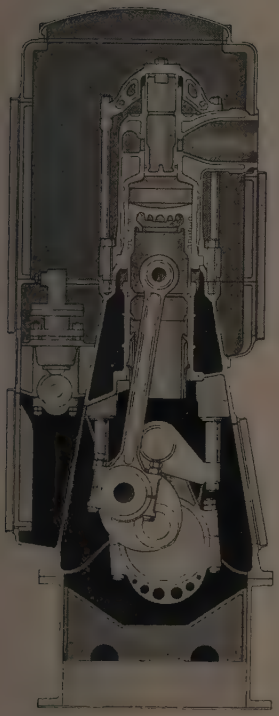

The Burmeister & Wain Diesel-Electric Locomotive

The B & W Locomotive Engine is designed on the two-cycle principle, special attention having been paid to the design of a strong and simple Engine, combining light weight, utmost reliability and economic working.

Quick Starting. - Great Acceleration Ability.
Largest Radius of Action.

B&W

Burmeister & Wain, Ltd.
COPENHAGEN
DENMARK.

100 H. P. DOUBLE GEARED

"Sentinel" Patent Locomotive

as supplied to the

LONDON & NORTH EASTERN RAILWAY
LONDON MIDLAND & SCOTTISH RAILWAY
TANGANYIKA RAILWAYS and many others

Tractive effort on low gear 11,750 lbs. up to 2 1/2 m. p. h.
Speeds on high gear up to 25 m. p. h.

"SENTINEL" PATENT LOCOMOTIVES are built for all gauges, of weights from six to thirty-five tons, and from eighty to two hundred horse power.

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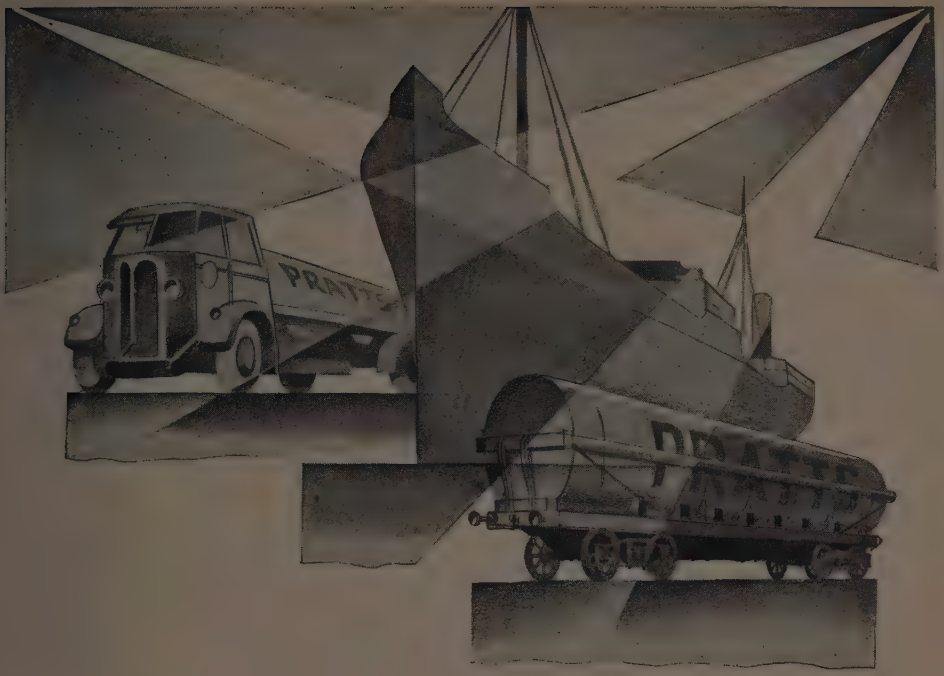

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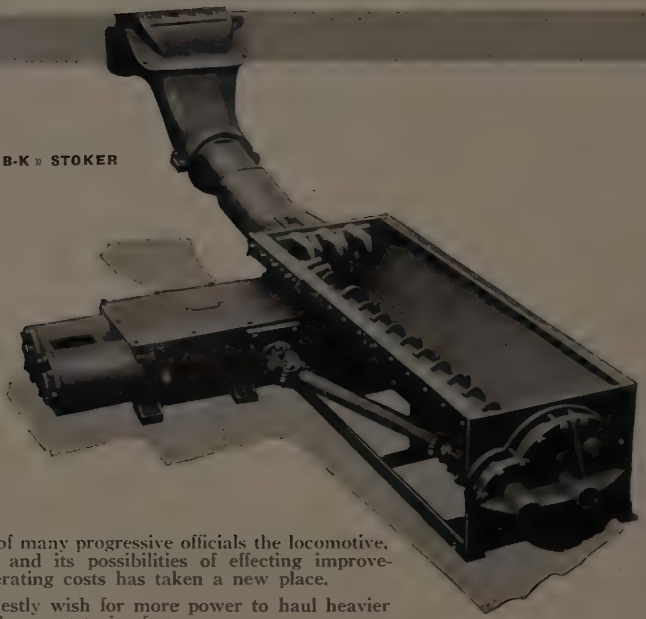

TYPE « B-K » STOKER

IN THE minds of many progressive officials the locomotive, new or old, and its possibilities of effecting improvements in operating costs has taken a new place.

These men earnestly wish for more power to haul heavier trains or to haul present trains faster.

Stoker firing increases sustained locomotive horsepower capacity by 15 to 25 per cent. This is true of any locomotive, new or old.

This extra capacity means lower operating costs per gross-ton-miles — greater net earnings.

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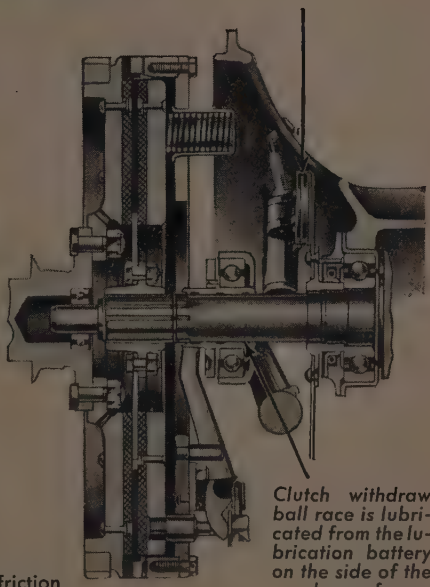
NEW YORK CHICAGO ERIE

FEATURES OF SUPERIORITY

No 5

110 H.P. 6 CYL.
CHASSIS
110 m/m BORE
x 130 m/m STROKE

A large and efficient clutch brake is fitted, the friction pad of which can be removed through the clutch housing.



Clutch withdraw ball race is lubricated from the lubrication battery on the side of the chassis frame.

LONG LIFE
Single plate clutch having exceptionally large area of friction surface, viz. 15 3/4" o. dia. x 4 3/4" width of face or 330 sq. ins. total area, thereby ensuring long life and ease of engagement.

EASY ADJUSTMENT
During the life of the linings only one adjustment of the three adjusting nuts is required, all other adjusment for wear being done by the external hand nut on the pedal lever easily accessible from the driver's seat.

APPLY FOR LITERATURE OF THE **"REGAL,,** SINGLE DECK BUS AND **"REGENT,,** DOUBLE DECKER.

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Copper Boiler Tubes

Years of investigation & experience have proved beyond doubt the superiority of Copper over Steel either as a Firebox or as a tube.

Copper ensures.

TUBE ECONOMY. A set of Copper Tubes will last 12 years or more — 3 or 4 times the average life of steel tubes.

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SCRAP VALUE. Old Copper tubes always bring full value as metal — old steel tubes have practically no value.

Test of Copper Tube (Hard).

Copper Boiler Tube (Hard).

Tensile Strength. . . . . 16.75 tons per sq. inch

Elongation. . . . . 41.25 % on 4".

Yield . . . . . 5.56 tons per sq. inch.

Illustration shows tube Flange Tested (cold).

Test of Copper Rod (Soft)

Tensile Strength. . . . . 15.06 tons per sq. inch.

Elongation . . . . . 48 % on 4".

Yield . . . . . 2.96 tons per sq. inch.

Illustration shows Rod after Bend Test (co'd).

Copper Rods For Locomotive

Firebox Stays, Rivets, Etc.

Broughton Copper Rods are made from fluid compressed castings, which are rolled and die drawn after being machined all over. This process ensures a homogeneous product of the very highest quality. Every Rod supplied to British Standard Specification (unless otherwise specified), and tested before despatch.

All Broughton products are manufactured from virgin metals of the highest quality (no old metal scrap is used) and are subjected to rigid inspection and tests at every stage of manufacture.

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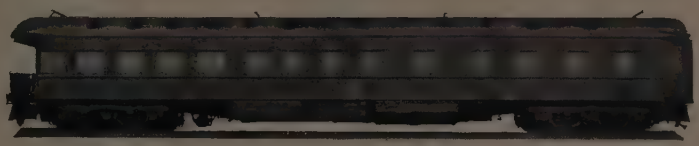
THE VAPOR SYSTEM

is 100% Efficient in any Climate

Swedish State Railway's Compartment Car
Over 500 cars in Sweden equipped with the **Vapor System**

With outside temperatures as low as 60° Cent. below zero, passengers are comfortable, and not a single case of freeze-up.



Private Car, President of **Mexico**

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A car equipped with the **"Vapor System"** will operate efficiently in any part of a train regardless of the types of heating system used on other cars in the same train.

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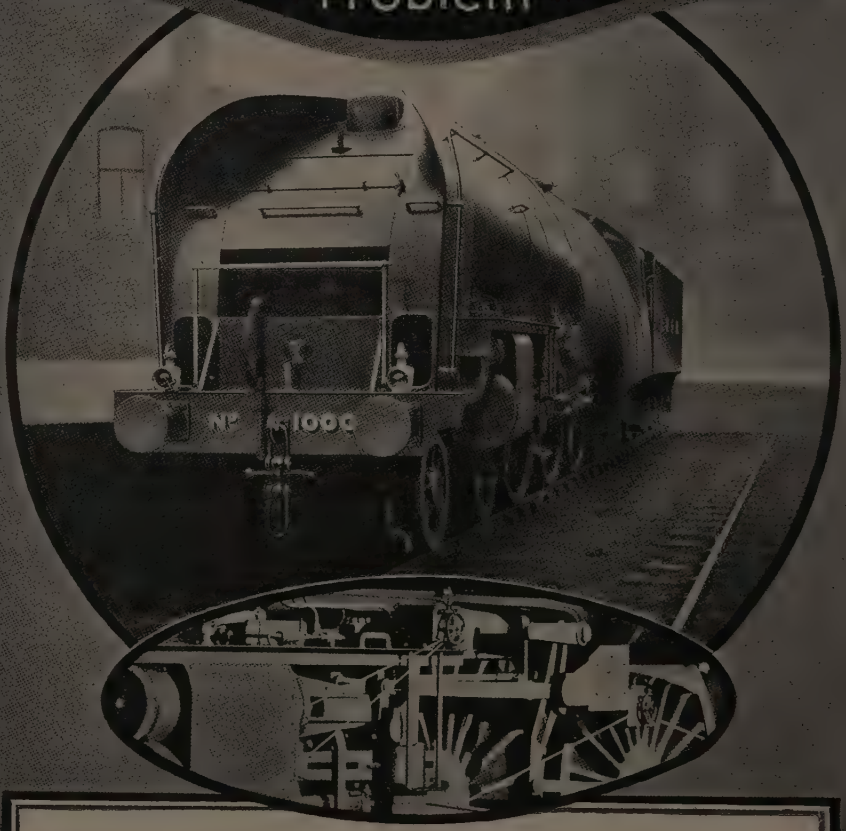
High Pressure Steam
-and the Lubrication Problem



THE L.N.E.R. 4-CYLINDER COMPOUND EXPRESS LOCOMOTIVE, depicted above, fitted with high-pressure Yarrow-Gresley boiler, is equipped with WAKEFIELD No. 7 pattern Mechanical Lubricators for valves, cylinders and axleboxes. One of the principal and most difficult problems associated with the use of steam at very high pressures in locomotives is that of lubricating the cylinders and piston valves; whilst for heavily loaded bearings forced lubrication has become a necessity. WAKEFIELD'S Mechanical Lubricators adequately meet both requirements.

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Albion Buses reduce the risk of expensive breakdowns, too, and give longer and far more reliable service than so-called "cheaper" vehicles. Cut your costs—

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Chloride Lux batteries attain the peak of battery efficiency and maintain their original capacities under working conditions for surprisingly long periods.

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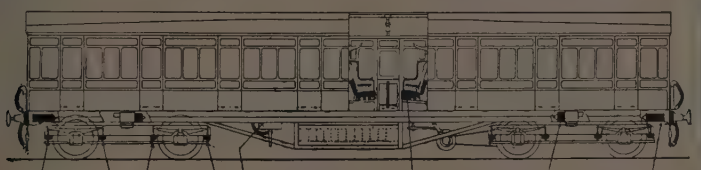
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C.F.H. 398

KNORR-BREMSE AG

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Guarantee:

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- Brake force adjustable to the load

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with **Compound Feed water pump**

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Willison and Knorr systems, connecting also automatic brake pipes and electric cables

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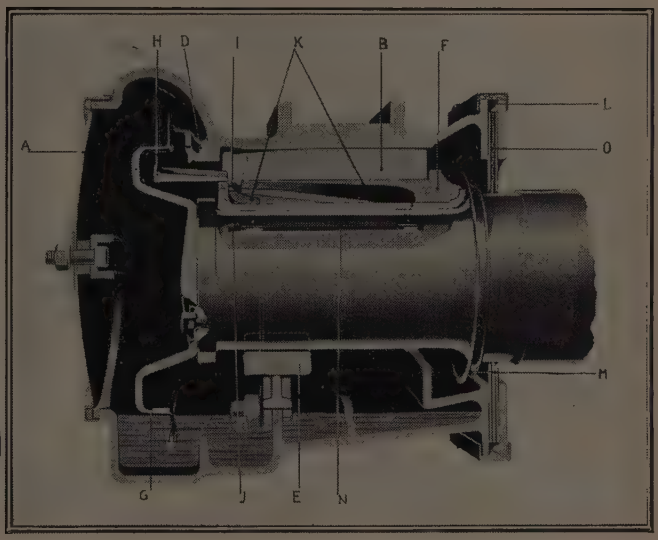

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It is thief proof, oil cannot be removed from it by unauthorised persons.

250,000 "Isothermos" boxes are in regular service on leading Railways operating in widely varying climatic conditions.

It is a tried and accepted proposition readily adaptable to every class of Railway and Tramway Rolling Stock.

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RAISING THE FEEDWATER OF LOCOMOTIVES
TO A VERY HIGH TEMPERATURE

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for all purposes

The « PILOT BRAND » of Springs are made only of the highest quality of material.—The greatest skill is used in their manufacture. They are finished with the greatest accuracy.

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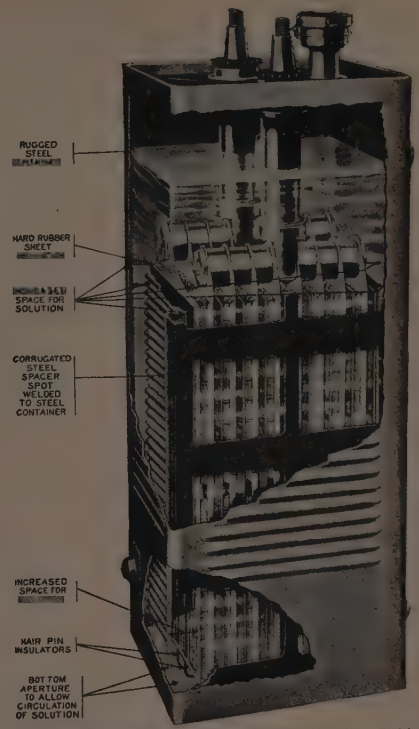
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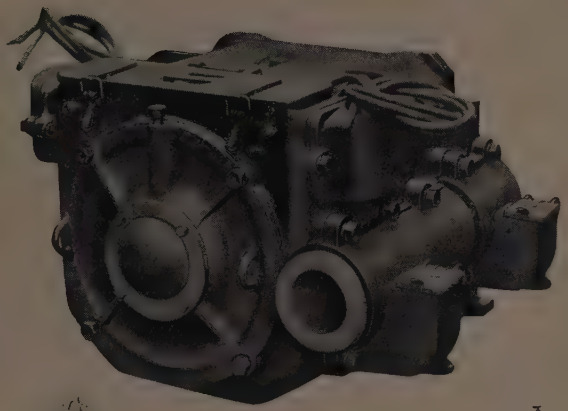

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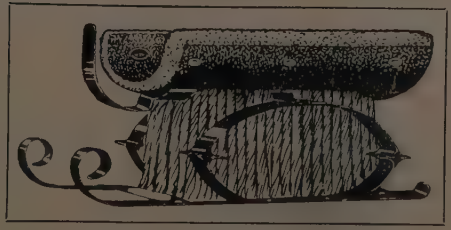

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